Ministry of Transportation Department of Rural Roads
The Kingdom of Thailand

A SURVEY FOR THE BRIDGE MAINTENANCE PLANNING (THE CHAO PHRAYA RIVER CROSSING BRIDGES) IN THE KINGDOM OF THAILAND

REPORT 4

"LONG-TERM MAINTENANCE PLAN AND ACTION PLAN FOR INDIVIDUAL BRIDGES"

March 2011

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

CHODAI CO., LTD.
METROPOLITAN EXPRESSWAY CO., LTD.

Ministry of Transportation Department of Rural Roads
The Kingdom of Thailand

A SURVEY
FOR
THE BRIDGE MAINTENANCE PLANNING
(THE CHAO PHRAYA RIVER CROSSING BRIDGES)
IN
THE KINGDOM OF THAILAND

FINAL REPORT

REPORT 4

"LONG-TERM MAINTENANCE PLAN AND ACTION PLAN FOR INDIVIDUAL BRIDGES"

March 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

CHODAI CO., LTD

METROPOLITAN EXPRESSWAY COMPANY LIMITED

THE BRIDGE MAINTENANCE PLANNING
(THE CHAO PHRAYA RIVER CROSSING BRIDGES)
FINAL REPORT

REPORT 4

" LONG-TERM MAINTENANCE PLAN AND ACTION PLAN FOR INDIVIDUAL BRIDGES"

TABLE OF CONTENTS

Chapter 1 Long-term maintenance plan for the individual bridges

1.1 Planning flow-chart

Maintenance cost for each individual bridge for 100 years hereafter is estimated according to the following flow chart based on the countermeasure classification determined by the bridge long-term maintenance manual and the inspection results.

The approximate repair cost here is based on the standard prices in Japan, which leads the cost is relatively higher.

(Approximate refer to Figure 1.1.1and 1.1.2)

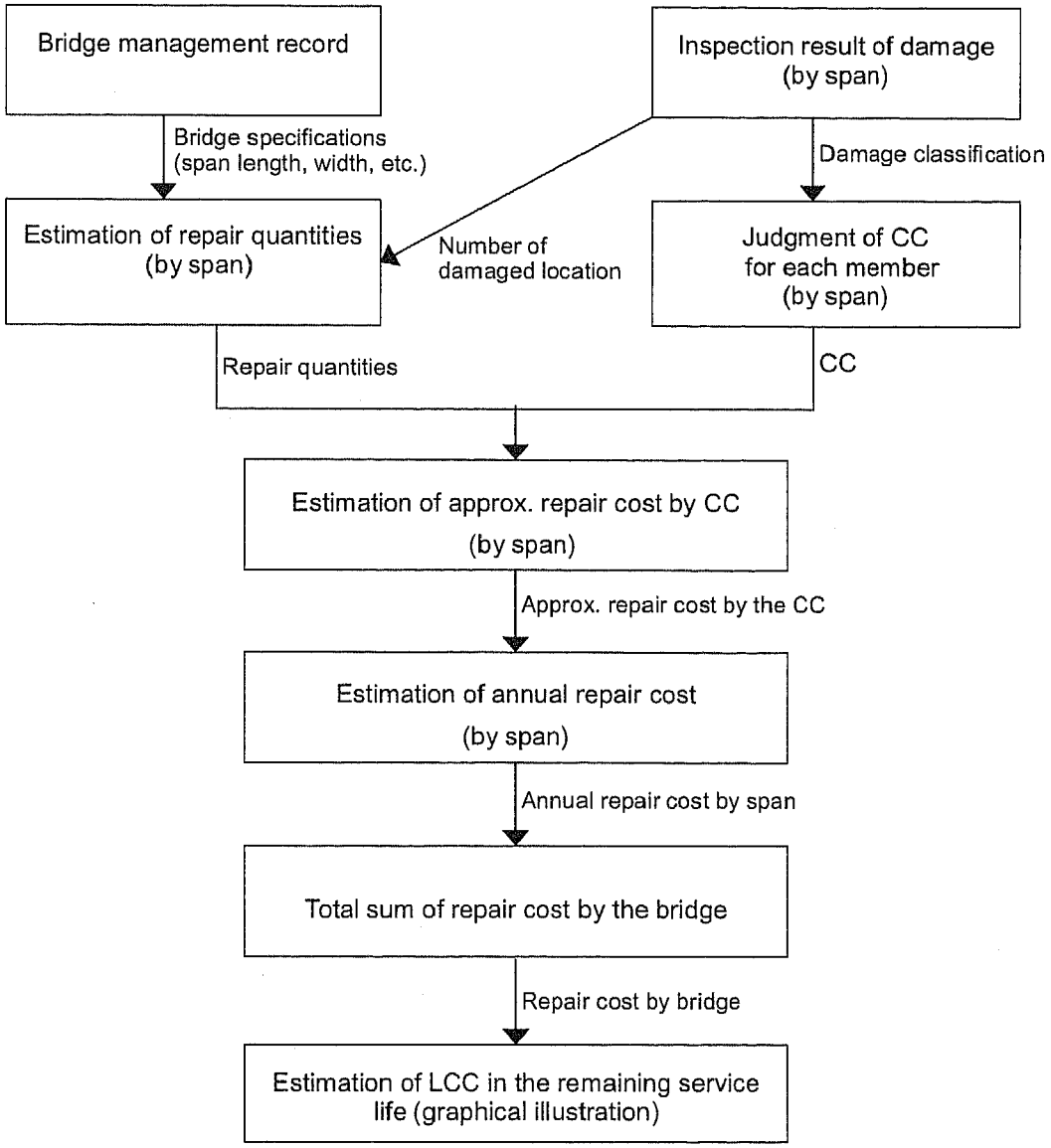


Figure1. 1. 1: Flow chart for long-term maintenance planning

Table 1.1.1: Repair methods for the damages detected in inspection

Bridge type	Member category			Damage	Repair method	Unit	Approximate repair cost Unit price(B)	Estimation of repair quantity: Calculation	Estimation of repair quantity: Remarks	Remaining years up to countermeasure cl. 2: countermeasure cl 5	countermeasure cl 4	countermeasure cl 3
Concrete bridge (RC) (PC)	Main member	Deck	Concrete (RC)	Rebar exposure	Patching	B/m²	17,500	A [illegible] 0.120	assumed to be 20% of cracking (a) 20%	30	15	7
				Deck cracking	CFR	B/m²	22,500	A [illegible] 0.620	from experience (a)	30	15	7
			Concrete (PC)	Rebar exposure	Patching	B/m²	17,500	A [illegible] 0.100	assumed to be 20% of cracking (a) 20%	30	15	-
				Deck cracking	CFR	B/m²	22,500	A [illegible] 0.500	assumed to be 80% of RC deck (a) 80% (b)	50	25	12
				Damages at anchorage of PC tendon	CFR (upper & bottom)	B/pos.	45,000	Number of damaged positions	assumed to be 1.0m 1.0m pos. and repaired every 2 pos	-	-	-
		Girder Crossbeam	Concrete (RC)	Cracking/Water leakage/Free lime	Resin injection	B/m	5,000	A [illegible] 0.050	from experience (c)	30	15	7
				Rebar exposure	Patching	B/m²	17,500	A [illegible] 0.010	from experience (d)	30	15	7
			Concrete (PC)	Cracking/Water leakage/Free lime	Resin injection	B/m	5,000	A [illegible] 0.040	assumed to be 80% of RC deck (c) 80%	30	15	7
				Rebar exposure	Patching	B/m²	17,500	A [illegible] 0.008	assumed to be 80% of RC deck (d) 80%	30	15	7
				Damages at anchorage of PC tendon	Reinforcement with external PC tendon	B/pos	1,000,000	Number of damaged positions	assumed to be the repair for 5m 4 cracks pos.	-	-	-
		Substructure	Concrete	Cracking/Water leakage/Free lime	Resin injection	B/m	5,000	Number of substr 5.540	from experience	30	15	-
				Rebar exposure	Patching	B/m²	17,500	Number of substr 2.240	from experience	30	15	7
				Damages in substructures (Scour)	Foot protection	B/substr	1,750,000	Number of substr 1.000	from experience	-	-	-
	Secondary member	Bearing		Functional damage of bearings	Metal spraying	B/bearing	120,000	Number of bearings 1.000	from experience	30	15	7
Steel bridge	Main member	Deck	Concrete (RC)	Rebar exposure	Patching	B/m²	17,500	A [illegible] 0.120	assumed to be 20% of cracking (e) 20%	30	15	7
				Deck cracking	CFR	B/m²	22,500	A [illegible] 0.620	from experience (e)	30	15	-
				Damages at anchorage of PC tendon	CFR (upper & bottom)	B/pos.	45,000	Number of damaged positions	assumed to be 1.0m 1.0m pos. and repaired every 2 pos	-	-	-
		Girder (Steel member)	Steel	Corrosion	Repaint with Rc-1 paint	B/m²	3,500	A_{paint} 1.000	Truss: A [illegible] (-1.09 10[illegible]) [illegible] 0.153 [illegible] 0.824	20	10	5
					Scaffolding	B/m²	3,000	A [illegible] 1.000	—	-	-	-
				Cracking	Reinf. with steel pl	B/pos.	166,700	Number of cracks 1.000	—	-	-	-
				Missing bolts	Bolt change for splice pl.	B/pos.	133,400	Number of repl 1.000	—	-	-	-
				Fracture	Reinforcement of fractured parts	B/pos.	166,700	Number of frac 1.000	—	-	-	-
				Deformation & loss	Replacement of deformed parts	B/pos	166,700	Number of deform 1.000	—	-	-	-
		Substructure	Concrete	Cracking/Water leakage/Free lime	Resin injection	B/m	5,000	Number of substr 5.540	from experience	30	15	7
				Rebar exposure	Patching	B/m²	17,500	Number of substr 2.240	from experience	30	15	-
				Damages in substructures (Scour)	Foot protection	B/substr	1,750,000	Number of substr 1.000	from experience	-	-	-
			Steel pier	Corrosion	Repaint with Rc-1 paint	B/m2	3,500	Number of substr 5.000	assumed to be 5.0m² substr	20	10	5
	Secondary member	Bearing		Functional damage of bearings (Corrosion)	Metal spraying	B/bearing	120,000	Number of bearings 1.000	from experience	30	15	-
Common members	Secondary member	Pavement		Level difference of road surface, Damages in pavements	Pavement replacement	B/m²	5,000	A [illegible] 1.000	incl. surface & base course and water proof	20	10	5
		Barriers Railings	Steel	Damages in barriers (Corrosion)	Change of steel railings	B/m	20,000	• L_{span} $N_{railing}$	—	30	15	-
			Concrete	Damages in barriers (Rebar exposure)	Patching	B/m²	17,500	A [illegible] 0.004	from experience	30	15	-
		Expansion joints	Rubber	Damages in expansion joints	Change of rubber exp	B/m	66,700	W [illegible] 1.000	—	15	7	3
			Steel	Damages in expansion joints	Change of steel exp	B/m	133,400	W [illegible] 1.000	—	30	15	-
			Filling material	Damages in expansion joints	Joint filling	B/m	10,000	W [illegible] 1.000	—	10	5	2

Note:
- Approx. unit price includes overhead (Approx. direct constr. cost 1.5)
- Numbers in countermeasure 5 indicate general service life
- The green coloured repair methods are the countermeasures to the result of periodic inspection
- The assumption for the repair quantity is based on the experience in Japan

Table1. 1. 2: List of planned repair and member renewal

	Bridge type	Member category		Damage	Repair cycle (Year)	Repair method	Unit	Approx. Repair cost unit price(B)	Assumption of repair quantity Formula
Planned repair	Concrete bridge (RC, PC)	Deck	Concrete (RC)	Deck cracking	30	CFR	B/m²	22,500	$A_{bridge\ surface}$ × 0.620
			Concrete (PC)	Deck cracking	50	CFR	B/m²	22,500	$A_{bridge\ surface}$ × 0.500
		Girder Crossbeam	Concrete (RC)	Rebar exposure	30	Patching	B/m²	17,500	$A_{bridge\ surface}$ × 0.010
			Concrete (PC)	Rebar exposure	30	Patching	B/m²	17,500	$A_{bridge\ surface}$ × 0.008
		Substructure	Concrete	Rebar exposure	30	Patching	B/m²	17,500	Number of substr × 2.240
	Steel Bridge	Deck	Concrete (RC)	Deck cracking	30	CFR	B/m²	22,500	$A_{bridge\ surface}$ × 0.620
		Girder	Steel	Corrosion	20	Repaint with Re-1 paint	B/m²	3,500	A_{paint} × 1.000
						Scaffolding	B/m²	3,000	$A_{bridge\ surface}$ × 1.000
		Substructure	Concrete	Rebar exposure	30	Patching	B/m²	17,500	Number of substr × 2.240
			Steel pier	Corrosion	20	Repaint with Re-1 paint	B/m²	3,500	Number of substr × 5.000
Planned renewal	Common members	Bearing		Functional damage of bearings (Corrosion)	30	Metal spraying	B/bearings	120,000	Numeber of bearings × 1.000
		Pavement	incl. water proofing	Level difference of road surface.	20	Pavement replacement	B/m²	5,000	$A_{bridge\ surface}$ × 1.000
		Barriers Railings	Steel	Damages in barriers (Corrosion)	30	Change of steel railings	B/m	20,000	L_{appu} × number of barriers
			Concrete	Damages in barriers (Rebar exposure)	30	Patching	B/m²	17,500	L_{appu} x 2.0m × number of barriers
		Expansion joints	Rubber	Damages in expansion joints	15	Change of rubber	B/m	66,700	$W_{total\ road}$ × 1.000
			Steel	Damages in expansion joints	30	Change of steel	B/m	133,400	$W_{total\ road}$ × 1.000
periodic inspection + reserve					2	---	B bridge	233,400	per bridge

Note: Approx. unit price includes overhead (Approx. direct constr. cost × 1.5)

1.2 Estimation procedure of truss bridge

(1) Bridge dimensions

1) Bridge name : Truss bridge A
2) Bridge type : 2-span simply supported steel truss
3) Bridge length : L=2×64.0=128.0m
4) Width : Vehicle lane width =10.600m,
Side walk width= 2×2.500=5.000m

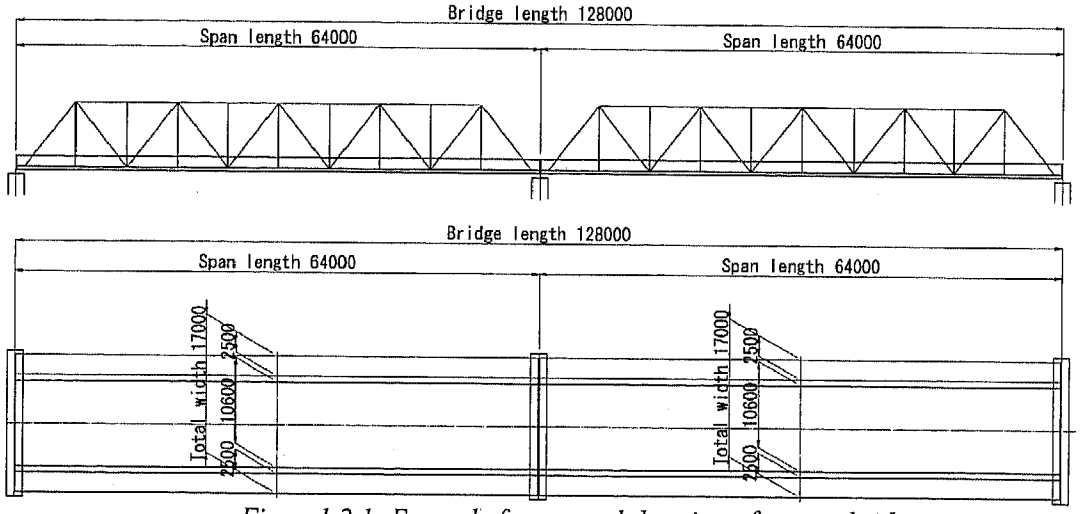


Figure1.2.1: Example for general drawing of a truss bridge

(2) Judgment of countermeasure classification for each member (by span)

Countermeasure classification is judged for each member according to the damage level obtained from the inspection results. In the judgment of some damage types further detail information regarding damages is necessary.

(3) Estimation of repair quantity (by span)

Repair quantity is estimated based on the bridge ledgers and inspection results. Painting area for steel member is estimated as follows:

[Estimation of painting area]

1) Estimation of total painting area

Table 1.2.1: Estimation of painting area of truss bridge

Bridge type	Steel weight w [tf/m²]	Painting area / steel weight	Painting area for total steel A [m²]
Truss Bridge	w= (5.45L-30.5)/1000 L: Span length [m]	A=-0.2L+27 L: Span length [m]	A= (Bridge area) × α_4 α_4=(-1.09×10^{-3}L^2+0.153L-0.824) Bridge area = Total width x Bridge length

According to the relation of span - steel weight, span length – steel weight, and span length – painting area / steel weight by reference to "2006 Design Data Book, Japan Bridge Association".

As the formula is not given for the approximated curve this literature, the formula is here reproduced as a linear line.

a) Steel weight / bridge area

Simply supported truss (Average W=9.5[m])

Span [m]	Steel weight / bridge area [t/m^2]
50	250
60	295
70	340
80	400
90	470

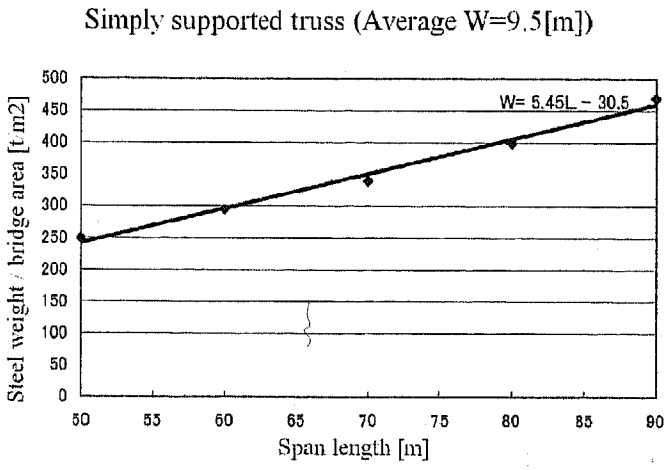


Figure1.2.2: Steel weight / bridge area of a truss bridge

b) Painting area / Steel weight

Simply supported truss (Average W=9.5[m])

Span [m]	Painting area / steel weight [m^2/t]
50	17
60	15
70	13
80	11
90	9

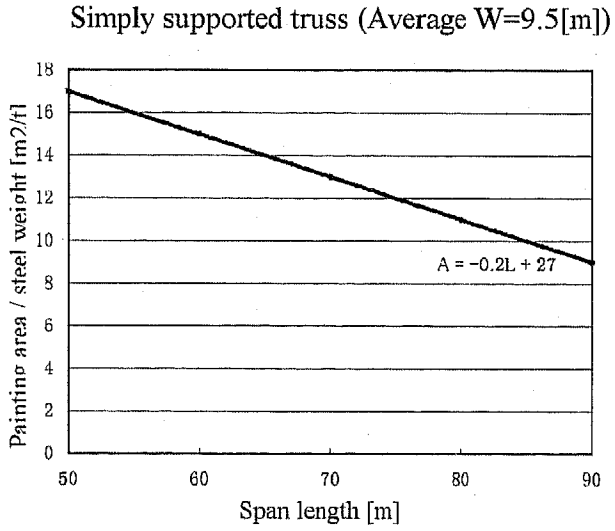
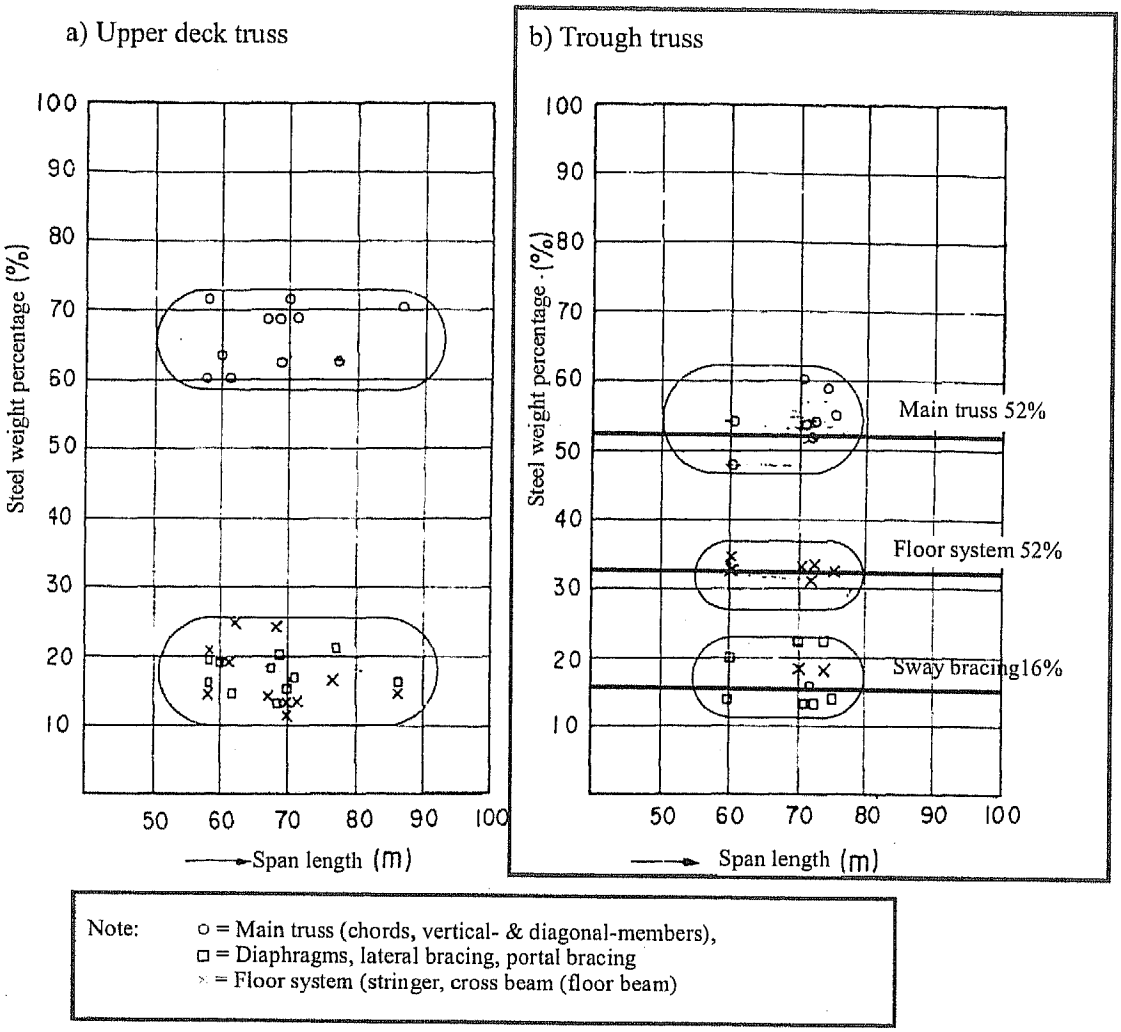


Figure1.2.3: Painting area/ bridge area of a truss bridge

2) Estimation of painting area for each member



Literature: "Metal design data", Long span bridge study group in Japan

Figure 1.2.4: Percentage of painting area of a truss bridge

(4) Estimation of approximate repair cost by countermeasure classification

Approximate repair cost by countermeasure is estimated based on the repair quantity and countermeasure for each member according to the approximate unit price for repair cost shown in Table 1.1.1.

(5) Estimation of approximate annual repair cost

While the repair cost is counted in the next year in case the damage inspection result is judged as "CC 2", it is counted in the year when the member reaches the stage of "CC 2" in case it is judged as "CC 3" or "CC 4" In case it is judged as "CC 5" or after the year when the above repair cost is counted, the approximate cost for the planned repair and renewal will be counted in a repair cycle. The sum of the above approximate repair cost is accumulated. (Refer to Table 1.1.2) The above approximate repair costs are accumulated for 100 years.

(6) Total sum of repair cost by bridge

The approximate repair cost estimated by span is accumulated for the whole bridge. In this example the repair cost is estimated assuming the both 2 spans are damaged similarly.

(7) Estimation of LCC in the remaining service life

The repair cost estimated in (6) is illustrated graphically to grasp the LCC of the remaining service life.

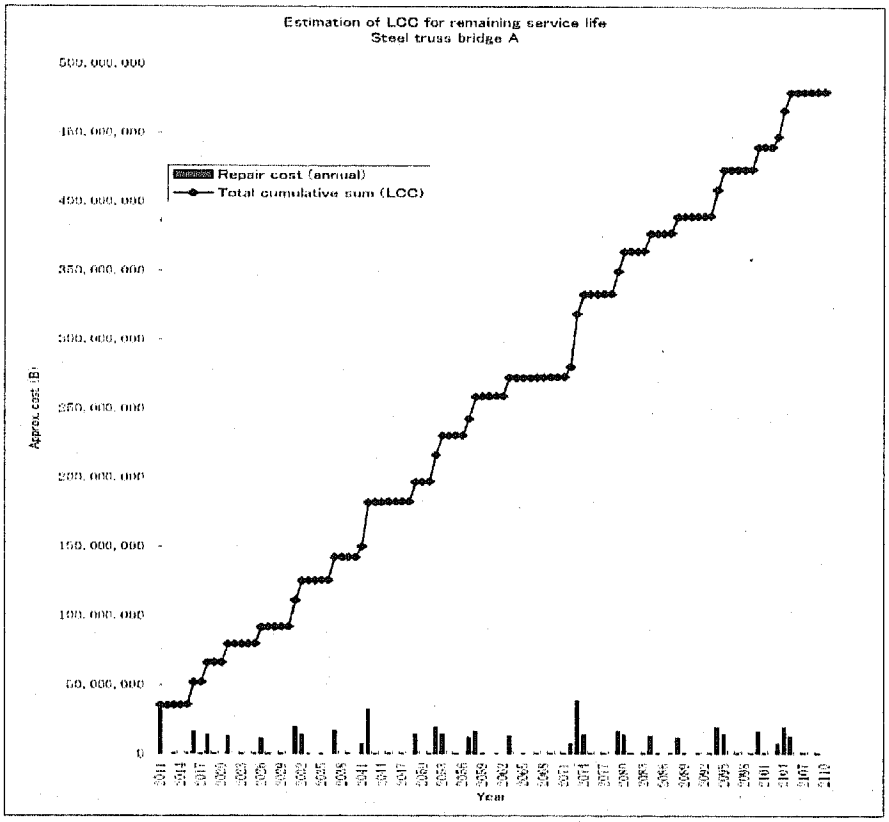


Figure 1.2.5 Estimation example for general drawing of a truss bridge

1.3 Estimation procedure of PC box girder bridge

(1) Bridge dimensions

1) Bridge name : PC box girder bridge B
2) Bridge type : 2-span continuous PC box girder
3) Bridge length : L=2×60.0=120.0m
4) Width : Vehicle lane width = 11.250m,
Side walk width = 1.500m

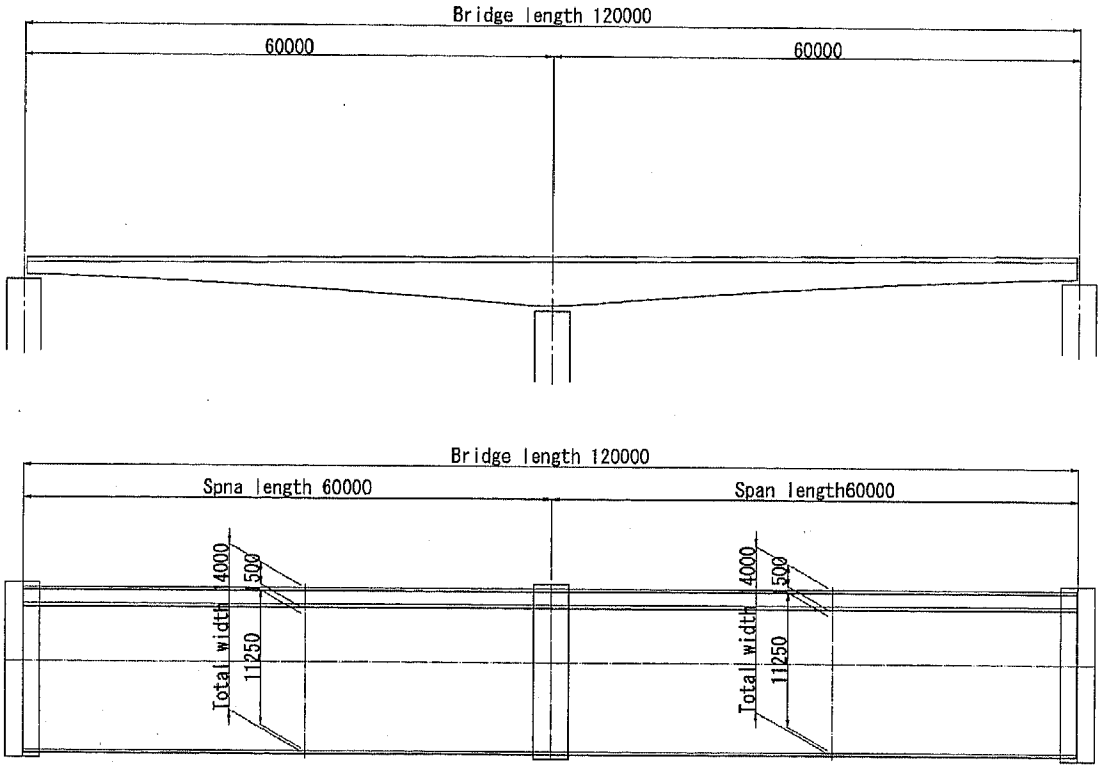


図 1.3.1. Example for general drawing of a PC box girder bridge

(2) Judgment of countermeasure classification for each member (by span)

Countermeasure classification is judged for each member according to the damage level obtained from the inspection results. In the judgment of some damage types further detail information regarding damages is necessary.

(3) Estimation of repair quantity (by span)

Repair quantity is estimated based on the bridge ledgers and inspection results.

(4) Estimation of approximate repair cost by countermeasure classification

Approximate repair cost by countermeasure is estimated based on the repair quantity and countermeasure for each member according to the approximate unit price for repair cost shown

in Table 1.1.1.

(5) Estimation of approximate annual repair cost

While the repair cost is counted in the next year in case the damage inspection result is judged as "CC 2", it is counted in the year when the member reaches the stage of "CC 2" in case it is judged as "CC 3" or "CC 4" In case it is judged as "CC 5" or after the year when the above repair cost is counted, the approximate cost for the planned repair and renewal will be counted in a repair cycle. The sum of the above approximate repair cost is accumulated. (Refer to Table 1.1.2) The above approximate repair costs are accumulated for 100 years.

(6) Total sum of repair cost by bridge

The approximate repair cost estimated by span is accumulated for the whole bridge. In this example the repair cost is estimated assuming the both 2 spans are damaged similarly.

(7) Estimation of LCC in the remaining service life

The repair cost estimated in (6) is illustrated graphically to grasp the LCC of the remaining service life.

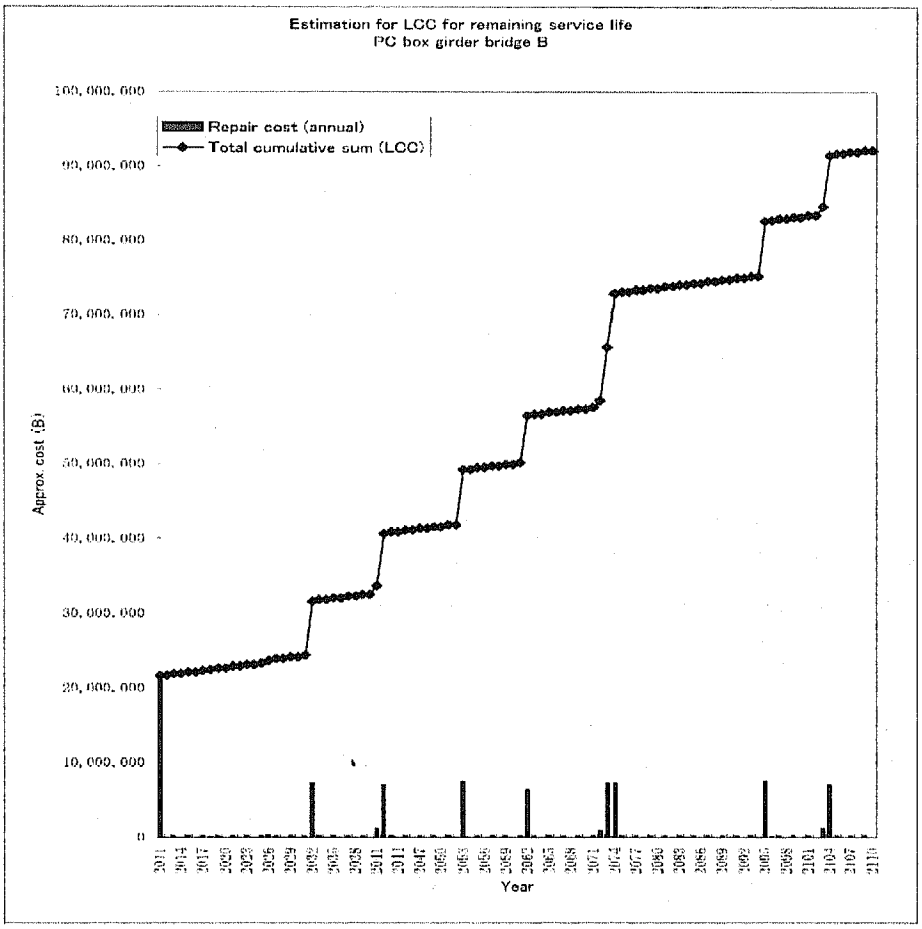
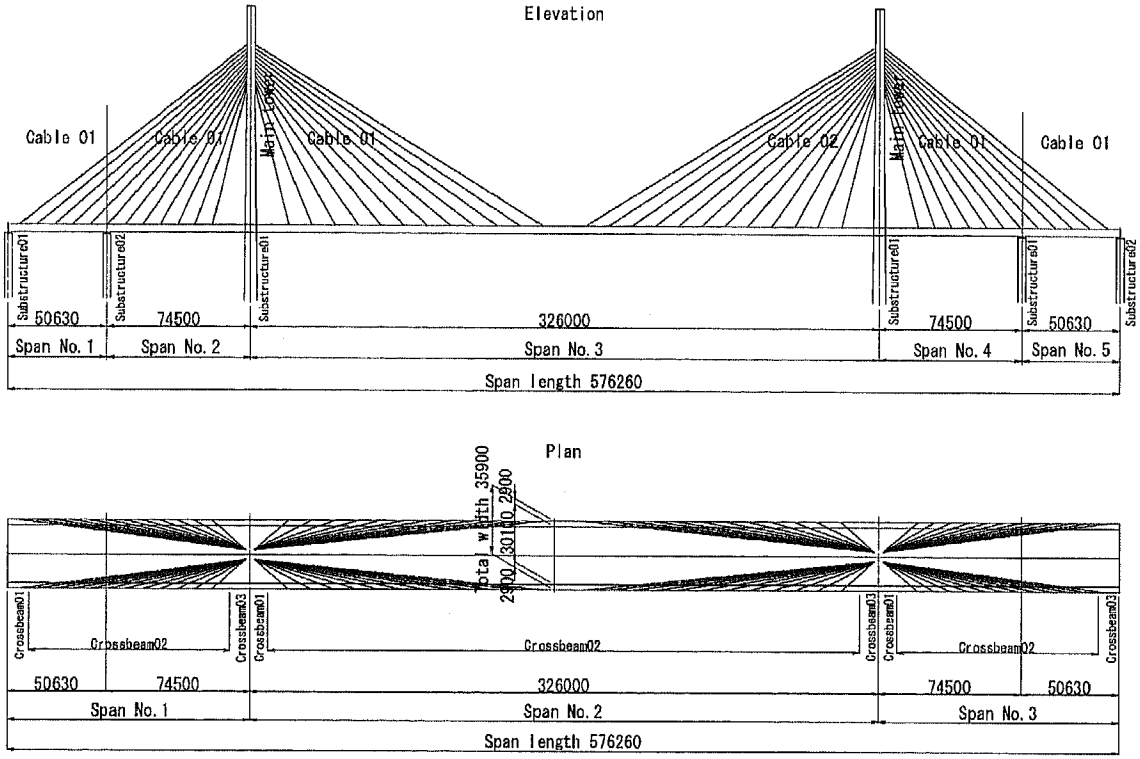


Figure 1.3.2 Estimation example for LCC of PC box girder

1.4 Estimation procedure of cable stayed bridge

(1) Bridge dimensions



1) Bridge name : Cable stayed bridge C
2) Bridge type : 5-span continuous composite bridge
3) Bridge length : L=576.260m
4) Width : Vehicle lane width = 30.100m,

(2) Judgment of countermeasure classification for each member (by span)

Countermeasure classification is judged for each member according to the damage level obtained from the inspection results. In the judgment of some damage types further information is necessary.

(3) Estimation of repair quantity (by span)

Repair quantity is estimated based on the bridge ledgers and inspection results.

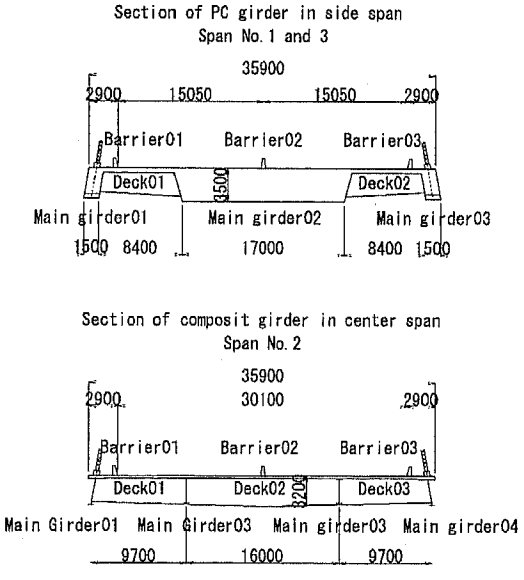


Figure 1.4.1 Example for general drawings of a cable stayed bridge

(4) Estimation of approximate repair cost by countermeasure classification

Approximate repair cost by countermeasure is estimated based on the repair quantity and countermeasure for each member according to the approximate unit price for repair cost shown in Table 1.1.1.

(5) Estimation of approximate annual repair cost

While the repair cost is counted in the next year in case the damage inspection result is judged as "CC 2", it is counted in the year when the member reaches the stage of "CC 2" in case it is judged as "CC 3" or "CC 4" In case it is judged as "CC 5" or after the year when the above repair cost is counted, the approximate cost for the planned repair and renewal will be counted in a repair cycle. The sum of the above approximate repair cost is accumulated. (Refer to Table 1.1.2) The above approximate repair costs are accumulated for 100 years.

(6) Total sum of repair cost by bridge

The approximate repair cost estimated by span is accumulated for the whole bridge. In this example the repair cost is estimated assuming the both 2 spans are damaged similarly.

(7) Estimation of LCC in the remaining service life

The repair cost estimated in (6) is illustrated graphically to grasp the LCC of the remaining service life.

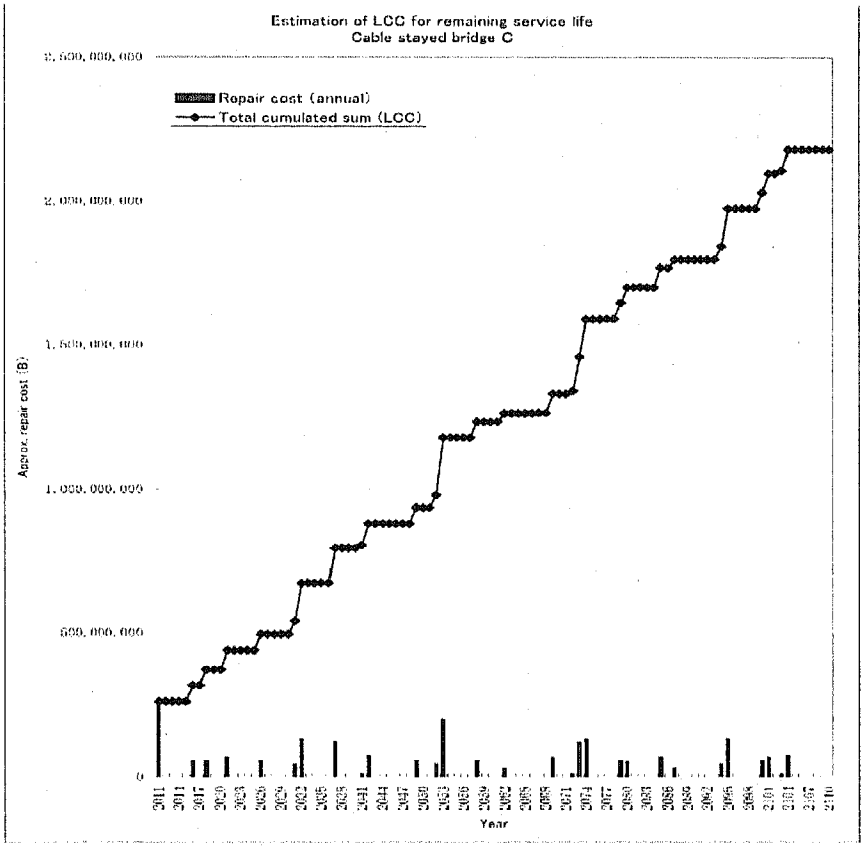


Figure 1.4.2 Estimation example for LCC of cable stayed bridge

1.5 Estimation of LCC for the individual bridges

1.5.1 Rama 4

Span No.1

Inspecton result

Span No.	1

		Damages of steel members				Damages of concrete members						Others						Remarks
		Corrosion	Cracking	Missing bolts	Fracture	Cracking, Water leakage, Free lime	No.	Rebar exposure	Pop-outs	Deck cracking	Damages at anchorage of PC tender	Level difference of road surface	Functional damage of bearings	Damages in substructures	Damages in pavements	Damages in expansion joints	Damages in cable	
Girder	01					a		a			a							
	02					a		a			a							
Deck	01							a	a	a								
	02							a	a	a								
	03							a	a	a								
	04							a	a	a								
	05							a	a	a								
	06							a	a	a								
Pier	01					a		a										
	02					a		a										
Bearings	101												a					
	102												a					
	103												a					
	104												a					
	105												a					
	106												a					
Road surface												a						
Pavement															a			
Barriers Railings	01															c		
	02															c		
	03															a		
	04															a		
Expansion joints	01																a	
Others																		

Span No.1

Countermeasure classification of members

Bridge name	001Rama IV	Span No.	1

Member	No.	Damage	Damage classification		Countermeasure classification	No.	Damage	Damage classification		Countermeasure classification
			Classification	Judge				Classification	Judge	
Girder	01	Cracking, Water leakage, Free lime	a	-	5	02	Cracking, Water leakage, Free lime	a	-	5
		Rebar exposure	a	-	5		Rebar exposure	a	-	5
		Damages at anchorage of PC tendon	a	-	5		Damages at anchorage of PC tendon	a	-	5
Deck	01	Rebar exposure	a		5	04	Rebar exposure	a		5
		Pop-outs	a		5		Pop-outs	a		5
		Deck cracking	a	N	5		Deck cracking	a	N	5
	03	Rebar exposure	a		5	06	Rebar exposure	a		5
		Pop-outs	a		5		Pop-outs	a		5
		Deck cracking	a	N	5		Deck cracking	a	N	5
Pier	01	Cracking, Water leakage, Free lime	a	-	5	02	Cracking, Water leakage, Free lime	a	-	5
		Rebar exposure	a	-	5		Rebar exposure	a	-	5
		Damages in substructures	a	-	5		Damages in substructures	a	-	5
Bearings	101	Functional damage of bearings	a		5	104	Functional damage of bearings	a		5
	102	Functional damage of bearings	a		5	105	Functional damage of bearings	a		5
	103	Functional damage of bearings	a		5	106	Functional damage of bearings	a		5
Road surface	01	Level difference of road surface	a		5	01	Damages in pavemnents	a		5
Barriers Railing	01	Damages in barriers	c		2	03	Damages in barriers	a		5
	02	Damages in barriers	c		2	04	Damages in barriers	a		5
Expansion joints	01	Damages in expansion joints	a		5	-	-	-	-	-

Estimation of repair quantity

Bridge name	001Rama IV		Span No.	1
	Subject	Quantity	Remarks	
1	Span length	72.00 m	Length of 1 span	
2	Road width for pavement	21.50 m	Width for pavement area (Vehicle lane)	
3	Total road width	26.90 m	Deck width	
4	Area of bridge surface	1,936.8 m^2	Span length x Total width	
5	Area of pavement	1,548.0 m^2	Span length x Width for pavement	
6	Barriers & railings 01	concrete	Type of barriers & railings	
	Barriers & railings 02	concrete	Same as above	
	Barriers & railings 03	concrete	Same as above	
	Barriers & railings 04	concrete	Same as above	
7	Expansion joints 01	steel	Type of expansion joint	
	Expansion joints -	-	Same as above	
8	Crack length	Quantity	Remarks	
	Total crack length L	77.5 m	A of bridge surf. x 0.040	
	Girder	38.7 m	L × 1/2 (per girder)	
9	Area of rebarb exposure	Quantity	Remarks	
	Total area A	15.5 m^2	A of bridge surf. x 0.008	
	Girder	7.7 m^2	L × 1/2 (per girder)	
10	Repaired area of deck	Quantity	Remarks	
	01,06 A	309.6 m^2	Deck width = 4.30 m	
	Area of rebarb exposure	3.1 m^2	A × 0.010	
	Area of deck cracking	15.5 m^2	A × 0.050	
	03,04 A	172.8 m^2	Deck width = 2.40 m	
	Area of rebarb exposure	1.7 m^2	A × 0.010	
	Area of deck cracking	8.6 m^2	A × 0.050	
11	Repair quanity of substructure	Quantity	Remarks	
	Cracking, Water leakage, Free lime	5.54 m	per substructure	
	Rebar exposure	2.24 m^2	per substructure	
12	Concrete barrier	Quantity	Remarks	
	Rebar exposure	7.75 m^2	A of bridge surf. x 0.004	

Approximate repair price for countermeasure

Bridge name	001Rama IV				Span No.		1									
Member	No.	Damage	Damage classification	Countermeasure classification	Repair method	Repair quantity	Unit	Approximate unit price (B)	Approximate repair price (B)	Approximate repair price for countermeasure classification 1 & 2 (B)	countermeasure classification 3		countermeasure classification 4		Planned repair & reconstruction	
											Repair price (B)	Remaining years up to counter measure cl. 2	Repair price (B)	Remaining years up to counter measure cl. 2	Repair price (B)	Life cycle
Girder	01	Cracking/Water leakage/Free lime	a	5	Resin injection	38.7	m	5,000	193,500	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	7.7	m^2	17,500	134,800	-	-	7	-	15	134,800	30
		Damages at anchorage of PC tendon	a	5	Reinforcement with external PC tendon	-	Pos.	1,000,000	-	-	-	-	-	-	-	-
	02	Cracking/Water leakage/Free lime	a	5	Resin injection	38.7	m	5,000	193,500	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	7.7	m^2	17,500	134,800	-	-	7	-	15	134,800	30
		Damages at anchorage of PC tendon	a	5	Reinforcement with external PC tendon	-	Pos.	1,000,000	-	-	-	-	-	-	-	-
Deck	01	Rebar exposure	a	5	Patching	3.1	m^2	17,500	54,300	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	15.5	m^2	22,500	348,800	-	-	12	-	25	348,800	50
	03	Rebar exposure	a	5	Patching	1.7	m^2	17,500	29,800	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	8.6	m^2	22,500	193,500	-	-	12	-	25	193,500	50
	04	Rebar exposure	a	5	Patching	1.7	m^2	17,500	29,800	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	8.6	m^2	22,500	193,500	-	-	12	-	25	193,500	50
	06	Rebar exposure	a	5	Patching	3.1	m^2	17,500	54,300	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	15.5	m^2	22,500	348,800	-	-	12	-	25	348,800	50
Pier	01	Cracking/Water leakage/Free lime	a	5	Resin injection	5.54	m	5,000	27,700	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	2.24	m^2	17,500	39,200	-	-	7	-	15	39,200	30
		Damages in substructures	a	5	Foot protection	-	Pier	1,750,000	-	-	-	-	-	-	-	-
	02	Cracking/Water leakage/Free lime	a	5	Resin injection	5.54	m	5,000	27,700	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	2.24	m^2	17,500	39,200	-	-	7	-	15	39,200	30
		Damages in substructures	a	5	Foot protection	-	Pier	1,750,000	-	-	-	-	-	-	-	-
Bearings	101	Functional damage of bearings	a	5	Metal spraying	1.0	Pier	120,000	120,000	-	-	7	-	15	120,000	30
	102	Functional damage of bearings	a	5	Metal spraying	1.0	〃	120,000	120,000	-	-	7	-	15	120,000	30
	103	Functional damage of bearings	a	5	Metal spraying	1.0	〃	120,000	120,000	-	-	7	-	15	120,000	30
	104	Functional damage of bearings	a	5	Metal spraying	1.0	〃	120,000	120,000	-	-	7	-	15	120,000	30
	105	Functional damage of bearings	a	5	Metal spraying	1.0	〃	120,000	120,000	-	-	7	-	15	120,000	30
	106	Functional damage of bearings	a	5	Metal spraying	1.0	〃	120,000	120,000	-	-	7	-	15	120,000	30
Road surface	01	Level difference of road surface	a	5	Pavement replacement	-	m^2	5,000	-	-	-	5	-	10	-	20
		Damages in pavemnents	a	5	same as above	1,548.0	〃	5,000	7,740,000	-	-	5	-	10	7,740,000	20
Barriers Railings	01	Damages in barriers	c	2	Patching	7.75	m^2	17,500	135,700	135,700	-	7	-	15	135,700	30
	02	Damages in barriers	c	2	Patching	7.75	m^2	17,500	135,700	135,700	-	7	-	15	135,700	30
	03	Damages in barriers	a	5	Patching	7.75	m^2	17,500	135,700	-	-	7	-	15	135,700	30
	04	Damages in barriers	a	5	Patching	7.75	m^2	17,500	135,700	-	-	7	-	15	135,700	30
Expansion joints	01	Damages in expansion joints	a	5	change of steel exp.	26.9	m	133,400	3,588,500	-	-	7	-	15	3,588,500	30

Span No.2

Inspecton result

Span No.	2

		Damages of steel members				Damages of concrete members						Others						
		Corrosion	Cracking	Missing bolts	Fracture	Cracking, Water leakage, Free lime	No.	Rebar exposure	Pop-outs	Deck cracking	Damages at anchorage of PC tender	Level difference of road surface	Functional damage of bearings	Damages in substructures	Damages in pavemnents	Damages in expansion joints	Damages in cable	Remarks
Girder	01					a		a			a							
	02					a		a			a							
Deck	01							a	a	a								
	02							a	a	a								
	03							a	a	a								
	04							a	a	a								
	05							a	a	a								
	06							a	a	a								
Pier	01					a		a										
	02					c		a										
Bearings	101												a					
	102												a					
	103												a					
	104												a					
	105												a					
	106												a					
Road surface												a						
Pavement															a			
Barriers Railings	01															a		
	02															c		
	03															a		
	04															a		
Others																		

Span No.2

Countermeasure classification of members					Bridge name		001Rama IV	Span No.		2
Member	No.	Damage	Damage classification		Countermeasure classification	No.	Damage	Damage classification		Countermeasure classification
			Classification	Judge				Classification	Judge	
Girder	01	Cracking, Water leakage, Free lime	a	-	5	02	Cracking, Water leakage, Free lime	a	-	5
		Rebar exposure	a	-	5		Rebar exposure	a	-	5
		Damages at anchorage of PC tendon	a	-	5		Damages at anchorage of PC tendon	a	-	5
Deck	01	Rebar exposure	a		5	05	Rebar exposure	a		5
		Pop-outs	a		5		Pop-outs	a		5
		Deck cracking	a	N	5		Deck cracking	a	N	5
	03	Rebar exposure	a		5	05	Rebar exposure	a		5
		Pop-outs	a		5		Pop-outs	a		5
		Deck cracking	a	N	5		Deck cracking	a	N	5
Pier	01	Cracking, Water leakage, Free lime	c	3	3	02	Cracking, Water leakage, Free lime	a	-	5
		Rebar exposure	a	-	5		Rebar exposure	a	-	5
		Damages in substructures	a	-	5		Damages in substructures	a	-	5
Bearings	101	Functional damage of bearings	a		5	104	Functional damage of bearings	a		5
	102	Functional damage of bearings	a		5	105	Functional damage of bearings	a		5
	103	Functional damage of bearings	a		5	106	Functional damage of bearings	a		5
Road surface	01	Level difference of road surface	a		5	01	Damages in pavemnents	a		5
Barriers Railing	01	Damages in barriers	a		5	03	Damages in barriers	a		5
	02	Damages in barriers	c		2	04	Damages in barriers	a		5

Estimation of repair quantity

Bridge name	001Rama IV		Span No.	2
	Subject	Quantity	Remarks	
1	Span length	134.00 m	Length of 1 span	
2	Road width for pavement	21.50 m	Width for pavement area (Vehicle lane)	
3	Total road width	26.90 m	Deck width	
4	Area of bridge surface	3,604.6 m^2	Span length x Total width	
5	Area of pavement	2,881.0 m^2	Span length x Width for pavement	
6	Barriers & railings 01	concrete	Type of barriers & railings	
	Barriers & railings 02	concrete	Same as above	
	Barriers & railings 03	concrete	Same as above	
	Barriers & railings 04	concrete	Same as above	
7	Expansion joints -	-	Type of expansion joint	
	Expansion joints -	-	//	
8	Crack length	Quantity	Remarks	
	Total crack length L	144.2 m	A of bridge surf. x 0.040	
	Girder	72.1 m	L × 1/2 (per girder)	
9	Area of rebarb exposure	Quantity	Remarks	
	Total area A	28.8 m^2	A of bridge surf. x 0.008	
	Girder	14.4 m^2	L × 1/2 (per girder)	
10	Repaired area of deck	Quantity	Remarks	
	01,06 A	576.2 m^2	Deck width = 4.30 m	
	Area of rebarb exposure	5.8 m^2	A × 0.010	
	Area of deck cracking	28.8 m^2	A × 0.050	
	03,04 A	321.6 m^2	Deck width = 2.40 m	
	Area of rebarb exposure	3.2 m^2	A × 0.010	
	Area of deck cracking	16.1 m^2	A × 0.050	
11	Repair quanity of substructure	Quantity	Remarks	
	Cracking, Water leakage, Free lime	5.54 m	per substructure	
	Rebar exposure	2.24 m^2	per substructure	
12	Concrete barrier	Quantity	Remarks	
	Rebar exposure	14.42 m^2	A of bridge surf. x 0.004	

Approximate repair price for countermeasure

Bridge name	001Rama IV				Span No.		2								
Member	No.	Damage	Damage classification	Countermeasure classification	Repair method	Repair quantity	Unit	Approximate unit price (B)	Approximate repair price (B)	Approximate repair price for countermeasure classification 1 & 2 (B)	countermeasure classification 3		countermeasure classification 4		Planned repair & reconstruction	
											Repair price (B)	Remaining years up to counter measure cl. 2	Repair price (B)	Remaining years up to counter measure cl. 2	Repair price (B)	Life cycle
Girder	01	Cracking/Water leakage/Free lime	a	5	Resin injection	72.1	m	5,000	360,500	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	14.4	m^2	17,500	252,000	-	-	7	-	15	252,000	30
		Damages at anchorage of PC tendon	a	5	Reinforcement with external PC tendon	-	Pos.	1,000,000	-	-	-	-	-	-	-	-
	02	Cracking/Water leakage/Free lime	a	5	Resin injection	72.1	m	5,000	360,500	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	14.4	m^2	17,500	252,000	-	-	7	-	15	252,000	30
		Damages at anchorage of PC tendon	a	5	Reinforcement with external PC tendon	-	Pos.	1,000,000	-	-	-	-	-	-	-	-
Deck	01	Rebar exposure	a	5	Patching	5.8	m^2	17,500	101,500	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	28.8	m^2	22,500	648,000	-	-	12	-	25	648,000	50
	03	Rebar exposure	a	5	Patching	3.2	m^2	17,500	56,000	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	16.1	m^2	22,500	362,300	-	-	12	-	25	362,300	50
	04	Rebar exposure	a	5	Patching	3.2	m^2	17,500	56,000	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	16.1	m^2	22,500	362,300	-	-	12	-	25	362,300	50
	06	Rebar exposure	a	5	Patching	5.8	m^2	17,500	101,500	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	28.8	m^2	22,500	648,000	-	-	12	-	25	648,000	50
Pier	01	Cracking/Water leakage/Free lime	c	3	Resin injection	5.54	m	5,000	27,700	-	27,700	7	-	15	-	30
		Rebar exposure	a	5	Patching	2.24	m^2	17,500	39,200	-	-	7	-	15	39,200	30
		Damages in substructures	a	5	Foot protection	-	Pier	1,750,000	-	-	-	-	-	-	-	-
	02	Cracking/Water leakage/Free lime	a	5	Resin injection	5.54	m	5,000	27,700	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	2.24	m^2	17,500	39,200	-	-	7	-	15	39,200	30
		Damages in substructures	a	5	Foot protection	-	Pier	1,750,000	-	-	-	-	-	-	-	-
Bearings	101	Functional damage of bearings	a	5	Metal spraying	1.0	Pier	120,000	120,000	-	-	7	-	15	120,000	30
	102	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	103	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	104	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	105	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	106	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
Road surface	01	Level difference of road surface	a	5	Pavement replacement	-	m^2	5,000	-	-	-	5	-	10	-	20
		Damages in pavemnents	a	5	same as above	2,881.0	//	5,000	14,405,000	-	-	5	-	10	14,405,000	20
Barriers Railings	01	Damages in barriers	a	5	Patching	14.42	m^2	17,500	252,400	-	-	7	-	15	252,400	30
	02	Damages in barriers	c	2	Patching	14.42	m^2	17,500	252,400	252,400	-	7	-	15	252,400	30
	03	Damages in barriers	a	5	Patching	14.42	m^2	17,500	252,400	-	-	7	-	15	252,400	30
	04	Damages in barriers	a	5	Patching	14.42	m^2	17,500	252,400	-	-	7	-	15	252,400	30

Span No.3

Inspecton result

		Span No.	3

		Damages of steel members				Damages of concrete members						Others						
		Corrosion	Cracking	Missing bolts	Fracture	Cracking, Water leakage, Free lime	No.	Rebar exposure	Pop-outs	Deck cracking	Damages at anchorage of PC tender	Level difference of road surface	Functional damage of bearings	Damages in substructures	Damages in pavemnents	Damages in expansion joints	Damages in cable	Remarks
Girder	01					c	4	a			a							
	02					c	4	a			a							
Deck	01							a	a	a								
	02							a	a	a								
	03							a	a	a								
	04							a	a	a								
	05							a	a	a								
	06							a	a	a								
Pier	01					a		a										
	02					a		a										
Bearings	101												a					
	102												a					
	103												a					
	104												a					
	105												a					
	106												a					
Road surface												a						
Pavement															a			
Barriers Railings	01															a		
	02															c		
	03															c		
	04															a		
Expansion joints	01																a	
Others																		

Span No.3

Countermeasure classification of members

Bridge name	001Rama IV	Span No.	3

Member	No.	Damage	Damage classification		Countermeasure classification	No.	Damage	Damage classification		Countermeasure classification
			Classification	Judge				Classification	Judge	
Girder	01	Cracking, Water leakage, Free lime	c	3	3	02	Cracking, Water leakage, Free lime	c	3	3
		Rebar exposure	a	-	5		Rebar exposure	a	-	5
		Damages at anchorage of PC tendon	a	-	5		Damages at anchorage of PC tendon	a	-	5
Deck	01	Rebar exposure	a		5	04	Rebar exposure	a		5
		Pop-outs	a		5		Pop-outs	a		5
		Deck cracking	a	N	5		Deck cracking	a	N	5
	03	Rebar exposure	a		5	06	Rebar exposure	a		5
		Pop-outs	a		5		Pop-outs	a		5
		Deck cracking	a	N	5		Deck cracking	a	N	5
Pier	01	Cracking, Water leakage, Free lime	a	-	5	02	Cracking, Water leakage, Free lime	a	-	5
		Rebar exposure	a	-	5		Rebar exposure	a	-	5
		Damages in substructures	a	-	5		Damages in substructures	a	-	5
Bearings	101	Functional damage of bearings	a		5	104	Functional damage of bearings	a		5
	102	Functional damage of bearings	a		5	105	Functional damage of bearings	a		5
	103	Functional damage of bearings	a		5	106	Functional damage of bearings	a		5
Road surface	01	Level difference of road surface	a		5	01	Damages in pavemnents	a		5
Barriers Railing	01	Damages in barriers	a		5	03	Damages in barriers	c		2
	02	Damages in barriers	c		2	04	Damages in barriers	a		5
Expansion	01	Damages in expansion joints	a		5	-	-	-	-	-

Estimation of repair quantity

Bridge name	001Rama IV			Span No.	3
	Subject		Quantity	Remarks	
1	Span length		72.00 m	Length of 1 span	
2	Road width for pavement		21.50 m	Width for pavement area (Vehicle lane)	
3	Total road width		26.90 m	Deck width	
4	Area of bridge surface		1,936.8 m^2	Span length x Total width	
5	Area of pavement		1,548.0 m^2	Span length x Width for pavement	
6	Barriers & railings	01	concrete	Type of barriers & railings	
		02	concrete	Same as above	
		03	concrete	Same as above	
		04	concrete	Same as above	
7	Expansion joints	01	-	Type of expansion joint	
		-	-	〃	
8	Crack length		Quantity	Remarks	
	Total crack length L		77.5 m	A of bridge surf. x 0.040	
	Girder		38.7 m	L × 1/2 (per girder)	
9	Area of rebarb exposure		Quantity	Remarks	
	Total area A		15.5 m^2	A of bridge surf. x 0.008	
	Girder		7.7 m^2	L × 1/2 (per girder)	
10	Repaired area of deck		Quantity	Remarks	
	01,05 A		309.6 m^2	Deck width = 4.30 m	
	Area of rebarb exposure		3.1 m^2	A × 0.010	
	Area of deck cracking		15.5 m^2	A × 0.050	
	03 A		172.8 m^2	Deck width = 2.40 m	
	Area of rebarb exposure		1.7 m^2	A × 0.010	
	Area of deck cracking		8.6 m^2	A × 0.050	
11	Repair quanity of substructure		Quantity	Remarks	
	Cracking, Water leakage, Free lime		5.54 m	per substructure	
	Rebar exposure		2.24 m^2	per substructure	
12	Concrete barrier		Quantity	Remarks	
	Rebar exposure		7.75 m^2	A of bridge surf. x 0.004	

Approximate repair price for countermeasure

Bridge name	001Rama IV				Span No.		3									
Member	No.	Damage	Damage classification	Countermeasure classification	Repair method	Repair quantity	Unit	Approximate unit price (B)	Approximate repair price (B)	Approximate repair price for countermeasure classification 1 & 2 (B)	countermeasure classification 3		countermeasure classification 4		Planned repair & reconstruction	
											Repair price (B)	Remaining years up to counter measure cl. 2	Repair price (B)	Remaining years up to counter measure cl. 2	Repair price (B)	Life cycle
Girder	01	Cracking/Water leakage/Free lime	c	3	Resin injection	38.7	m	5,000	193,500	-	193,500	7	-	15	-	30
		Rebar exposure	a	5	Patching	7.7	m^2	17,500	134,800	-	-	7	-	15	134,800	30
		Damages at anchorage of PC tendon	a	5	Reinforcement with external PC tendon	-	Pos.	1,000,000	-	-	-	-	-	-	-	-
	02	Cracking/Water leakage/Free lime	c	3	Resin injection	38.7	m	5,000	193,500	-	193,500	7	-	15	-	30
		Rebar exposure	a	5	Patching	7.7	m^2	17,500	134,800	-	-	7	-	15	134,800	30
		Damages at anchorage of PC tendon	a	5	Reinforcement with external PC tendon	-	Pos.	1,000,000	-	-	-	-	-	-	-	-
Deck	01	Rebar exposure	a	5	Patching	3.1	m^2	17,500	54,300	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	15.5	m^2	22,500	348,800	-	-	12	-	25	348,800	50
	03	Rebar exposure	a	5	Patching	1.7	m^2	17,500	29,800	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	8.6	m^2	22,500	193,500	-	-	12	-	25	193,500	50
	04	Rebar exposure	a	5	Patching	1.7	m^2	17,500	29,800	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	8.6	m^2	22,500	193,500	-	-	12	-	25	193,500	50
	05	Rebar exposure	a	5	Patching	3.1	m^2	17,500	54,300	-	-	7	-	15	-	30
		Pop-outs	a	5	Patching & CFR	-	Pos.	10,000	-	-	-	-	-	-	-	-
		Deck cracking	a	5	CFR	15.5	m^2	22,500	348,800	-	-	12	-	25	348,800	50
Pier	01	Cracking/Water leakage/Free lime	a	5	Resin injection	5.54	m	5,000	27,700	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	2.24	m^2	17,500	39,200	-	-	7	-	15	39,200	30
		Damages in substructures	a	5	Foot protection	-	Pier	1,750,000	-	-	-	-	-	-	-	-
	02	Cracking/Water leakage/Free lime	a	5	Resin injection	5.54	m	5,000	27,700	-	-	7	-	15	-	30
		Rebar exposure	a	5	Patching	2.24	m^2	17,500	39,200	-	-	7	-	15	39,200	30
		Damages in substructures	a	5	Foot protection	-	Pier	1,750,000	-	-	-	-	-	-	-	-
Bearings	101	Functional damage of bearings	a	5	Metal spraying	1.0	Pier	120,000	120,000	-	-	7	-	15	120,000	30
	102	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	103	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	104	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	105	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
	106	Functional damage of bearings	a	5	Metal spraying	1.0	//	120,000	120,000	-	-	7	-	15	120,000	30
Road surface	01	Level difference of road surface	a	5	Pavement replacement	-	m^2	5,000	-	-	-	5	-	10	-	20
		Damages in pavemments	a	5	same as above	1,548.0	//	5,000	7,740,000	-	-	5	-	10	7,740,000	20
Barriers Railings	01	Damages in barriers	a	5	Patching	7.75	m^2	17,500	135,700	-	-	7	-	15	135,700	30
	02	Damages in barriers	c	2	Patching	7.75	m^2	17,500	135,700	135,700	-	7	-	15	135,700	30
	03	Damages in barriers	c	2	Patching	7.75	m^2	17,500	135,700	135,700	-	7	-	15	135,700	30
	04	Damages in barriers	a	5	Patching	7.75	m^2	17,500	135,700	-	-	7	-	15	135,700	30
Expansion joints	01	Damages in expansion joints	a	5	change of steel exp.	26.9	m	133,400	3,588,500	-	-	7	-	15	3,588,500	30

Approximate total repair cost

Year	Annual repair cost (B)					Cummalative cost (B)
	Span No.1	Span No.2	Span No.3	Periodic inspection + reserve for unexpected matters	Bridge total	
2011	271,400	252,400	271,400	233,400	1,028,600	1,028,600
2012	-	-	-	-	-	1,028,600
2013	-	-	-	-	-	1,028,600
2014	-	-	-	-	-	1,028,600
2015	-	-	-	-	-	1,028,600
2016	-	-	-	233,400	233,400	1,262,000
2017	-	-	-	-	-	1,262,000
2018	-	27,700	387,000	-	414,700	1,676,700
2019	-	-	-	-	-	1,676,700
2020	-	-	-	-	-	1,676,700
2021	-	-	-	233,400	233,400	1,910,100
2022	-	-	-	-	-	1,910,100
2023	-	-	-	-	-	1,910,100
2024	-	-	-	-	-	1,910,100
2025	-	-	-	-	-	1,910,100
2026	-	-	-	233,400	233,400	2,143,500
2027	-	-	-	-	-	2,143,500
2028	-	-	-	-	-	2,143,500
2029	-	-	-	-	-	2,143,500
2030	-	-	-	-	-	2,143,500
2031	7,740,000	14,405,000	7,740,000	233,400	30,118,400	32,261,900
2032	-	-	-	-	-	32,261,900
2033	-	-	-	-	-	32,261,900
2034	-	-	-	-	-	32,261,900
2035	-	-	-	-	-	32,261,900
2036	-	-	-	233,400	233,400	32,495,300
2037	-	-	-	-	-	32,495,300
2038	-	-	-	-	-	32,495,300
2039	-	-	-	-	-	32,495,300
2040	-	-	-	-	-	32,495,300
2041	4,927,900	2,059,600	4,927,900	233,400	12,148,800	44,644,100
2042	271,400	252,400	271,400	-	795,200	45,439,300
2043	-	-	-	-	-	45,439,300
2044	-	-	-	-	-	45,439,300
2045	-	-	-	-	-	45,439,300
2046	-	-	-	233,400	233,400	45,672,700
2047	-	-	-	-	-	45,672,700
2048	-	-	-	-	-	45,672,700
2049	-	-	-	-	-	45,672,700
2050	-	-	-	-	-	45,672,700
2051	-	-	-	233,400	233,400	45,906,100
2052	7,740,000	14,405,000	7,740,000	-	29,885,000	75,791,100
2053	-	-	-	-	-	75,791,100
2054	-	-	-	-	-	75,791,100
2055	-	-	-	-	-	75,791,100
2056	-	-	-	233,400	233,400	76,024,500
2057	-	-	-	-	-	76,024,500
2058	-	-	-	-	-	76,024,500
2059	-	-	-	-	-	76,024,500
2060	-	-	-	-	-	76,024,500

Year	Annual repair cost (B)					Cummalative cost (B)
	Span No.1	Span No.2	Span No.3	Periodic inspection + reserve for unexpected matters	Bridge total	
2061	1,084,600	2,020,600	1,084,600	233,400	4,423,200	80, 447, 700
2062	-	-	-	-	-	80, 447, 700
2063	-	-	-	-	-	80, 447, 700
2064	-	-	-	-	-	80, 447, 700
2065	-	-	-	-	-	80, 447, 700
2066	-	-	-	233,400	233,400	80, 681, 100
2067	-	-	-	-	-	80, 681, 100
2068	-	-	-	-	-	80, 681, 100
2069	-	-	-	-	-	80, 681, 100
2070	-	-	-	-	-	80, 681, 100
2071	-	-	-	233,400	233,400	80, 914, 500
2072	4,927,900	2,059,600	4,927,900	-	11,915,400	92, 829, 900
2073	8,011,400	14,657,400	8,011,400	-	30,680,200	123, 510, 100
2074	-	-	-	-	-	123, 510, 100
2075	-	-	-	-	-	123, 510, 100
2076	-	-	-	233,400	233,400	123, 743, 500
2077	-	-	-	-	-	123, 743, 500
2078	-	-	-	-	-	123, 743, 500
2079	-	-	-	-	-	123, 743, 500
2080	-	-	-	-	-	123, 743, 500
2081	-	-	-	233,400	233,400	123, 976, 900
2082	-	-	-	-	-	123, 976, 900
2083	-	-	-	-	-	123, 976, 900
2084	-	-	-	-	-	123, 976, 900
2085	-	-	-	-	-	123, 976, 900
2086	-	-	-	233,400	233,400	124, 210, 300
2087	-	-	-	-	-	124, 210, 300
2088	-	-	-	-	-	124, 210, 300
2089	-	-	-	-	-	124, 210, 300
2090	-	-	-	-	-	124, 210, 300
2091	-	-	-	233,400	233,400	124, 443, 700
2092	-	-	-	-	-	124, 443, 700
2093	-	-	-	-	-	124, 443, 700
2094	7,740,000	14,405,000	7,740,000	-	29,885,000	154, 328, 700
2095	-	-	-	-	-	154, 328, 700
2096	-	-	-	233,400	233,400	154, 562, 100
2097	-	-	-	-	-	154, 562, 100
2098	-	-	-	-	-	154, 562, 100
2099	-	-	-	-	-	154, 562, 100
2100	-	-	-	-	-	154, 562, 100
2101	-	-	-	233,400	233,400	154, 795, 500
2102	-	-	-	-	-	154, 795, 500
2103	4,927,900	2,059,600	4,927,900	-	11,915,400	166, 710, 900
2104	271,400	252,400	271,400	-	795,200	167, 506, 100
2105	-	-	-	-	-	167, 506, 100
2106	-	-	-	233,400	233,400	167, 739, 500
2107	-	-	-	-	-	167, 739, 500
2108	-	-	-	-	-	167, 739, 500
2109	-	-	-	-	-	167, 739, 500
2110	-	-	-	-	-	167, 739, 500

Eestimation of LCC