2.2.9 Cables

(17) Damages in cable

(a) General description and damage characteristics

This subject is defined as the damage occurring in the cables and the anchorages of the cables of cable stayed bridges.

(b) Relation to the other damages

- It is difficult to inspect corrosion on the cables directly so that it shall be evaluated by means of the damage on the cable sheathing, the leaking rust stain from the anchorage, etc..
- The concrete damages at the anchorage shall be evaluated in the subjects of cracking, water leakage, free lime, rebar exposure, etc..

(c) Inspection area

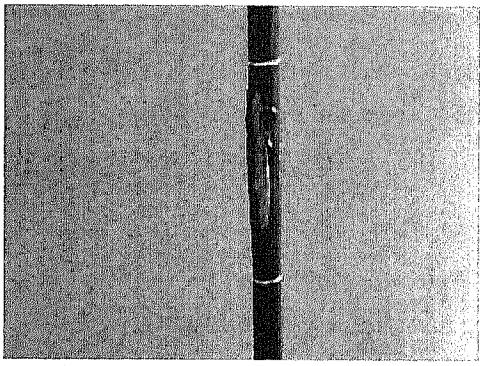
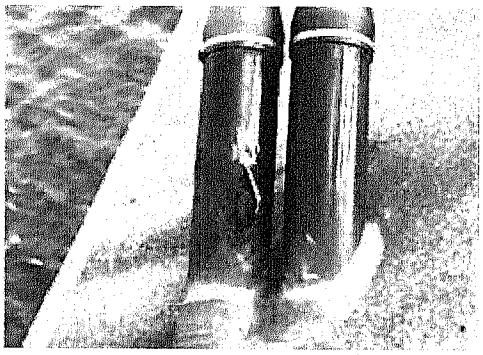
The damages in the cables such as deterioration of cable sheathing, deflection, twist, fracture, etc. and those in the cable anchorages such as deterioration of waterstop cover, missing bolts, corrosion, deterioration and missing of sealing material, etc. are inspected approaching closely or using binocular.

(d) Classification of damages

The inspected results shall be evaluated with the following classification:

Evaluation criteria	Classification
No damage	a
Damaged	e

(Examples)

Damage level e	Damage level e
	
Damage of cable	Damage of anchorage

3. Inspection records

The inspection results shall be recorded for each span according to the followings. Spans are numbered as 1, 2... from the beginning point numbering members for each span according to the following procedure.

3.1 Recording guide for the inspection results

(1) Bridge data

The following data should be filled:

a) Recording date

b) Identification data (bridge name, route name, jurisdiction, location, etc.)

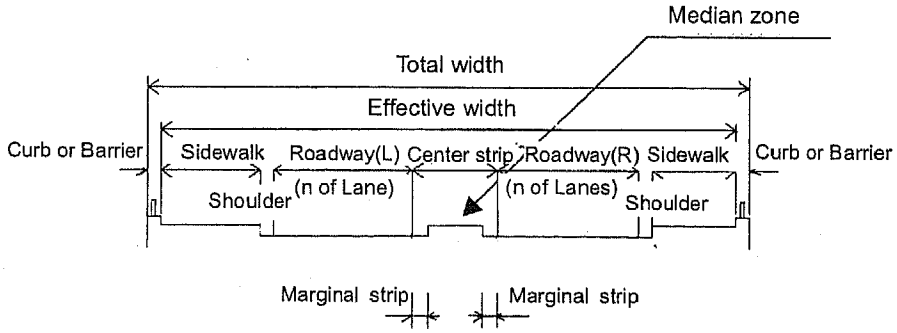
c) Data regarding service condition (date in service, live load, applied specification, etc)

d) Basic components of whole bridge (bridge length/number of total spans/structural type)

e) Traffic condition (year of traffic survey/heavy vehicle ratio/traffic/load restriction)

f) Width of road

The items shown in the following figure are provided to cover the different road width type. The inapplicable items need not be filled.



g) Data regarding bridge location

These are provided for the following purpose:

- Distance from the coast: Information for chloride damage
- Designation for emergency transportation road:

  The road designated in the disaster prevention plan for the wide range countermeasures such as evacuation, rescue, material supply, facility restoration, etc.. Information for the judgement of the repair priority.
- Priority route:

  Especially important stretch among the emergency transportation roads, which combines the main disaster prevention bases and the cities. Information for the judgement of the repair priority.
- Condition under bridge: crossing condition under the bridge (river, road, etc.)

h) Overall view of bridge and general view for each span

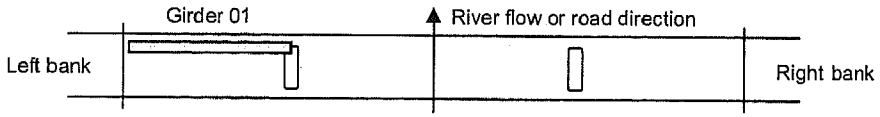
(2) Site photo

The photos show the outline of the bridge site (overall, under the bridge, on the bridge) should be attached for each span.

a) Recording date : The date when the form is recorded after the inspection
b) Photo No. : Corresponding number to the photo (from left to right No.1, 2, 3 --)
c) Span No. : Corresponding span No. to the photo
d) Description : Photo target such as side, road surface, under the bridge, etc.
e) Inspection date : The date when the photos are taken
f) Note : Supplementary explanation for the photos

(3) Member numbering scheme

Member shall be numbered from left bank and downstream in principle.

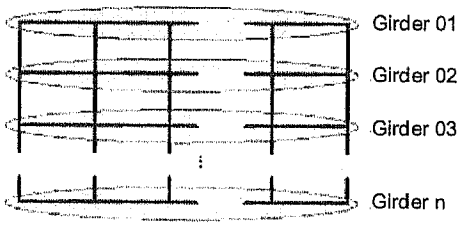


In case of special bridge type in which it is difficult to record according to the following procedure, the members shall be appropriately devided and numbered.
Member No. according to the following numbering rules shall be illustrated for each span.

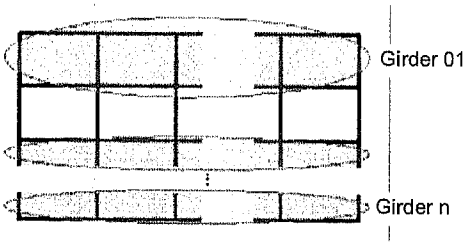
1) Girder and stringer

In principle these shall be defined in each girder.

i) Steel plate girder, concrete T-shaped girder



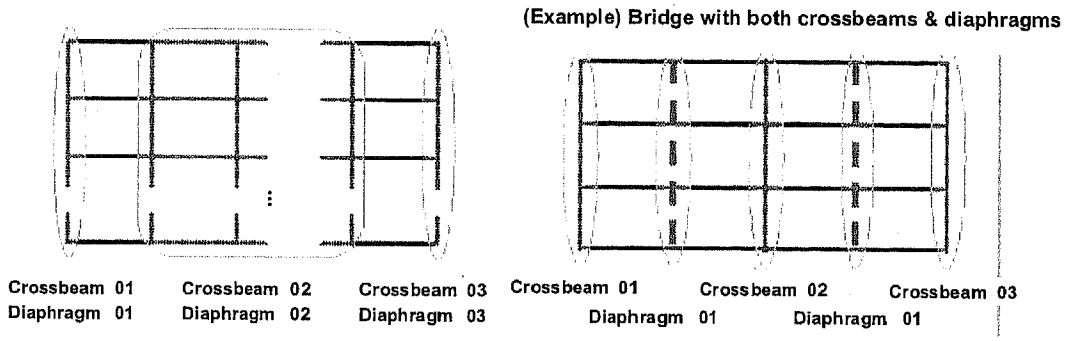
ii) Box girder etc.



The bridges can not be devided in each girder such as a slab bridge shall be defined as "Girder 01" as a whole.

2) Crossbeam and diaphragm

These shall be devided into "end part" and "intermediate part".
In case a bridge has both crossbeams and diaphragms the end parts shall be considered as 01 and the intermediate parts as 02 respectively (refer to the right figure below).

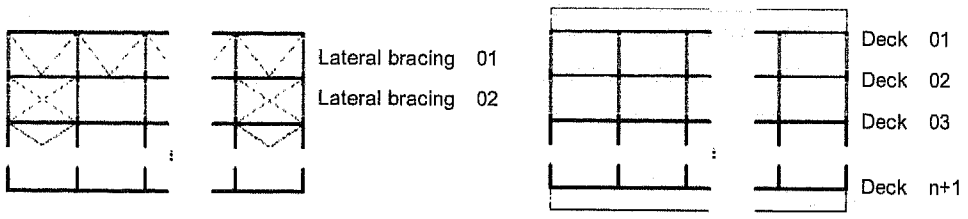


In case of a box girder the crossbeam and diaphragm on the same line may not be considered independently.

3) Lateral bracing and deck

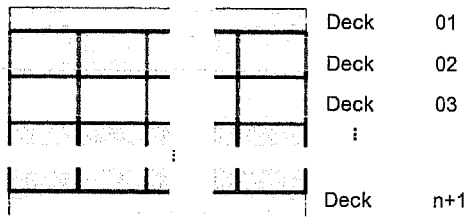
These shall be defined in each line between the girders.

i) Steel plate girder, concrete T-shaped girder



For prestressed concrete T-shaped girders, only CIP-slab parts shall be defined as a deck in principle. For reinforced concrete T-shaped girders the parts except haunches shall be defined as a deck and the upper flanges and haunches are defined as a girder.

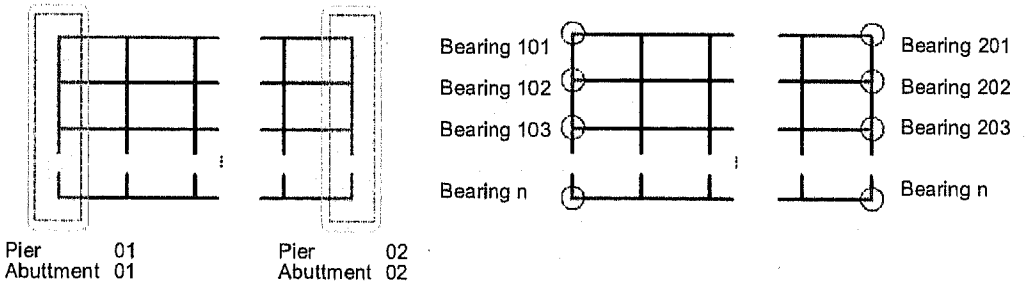
ii) Box girder etc.



For slab bridges etc. only the cantilevered deck and the CIP-slab parts shall be defined as a deck and the other parts as a girder.

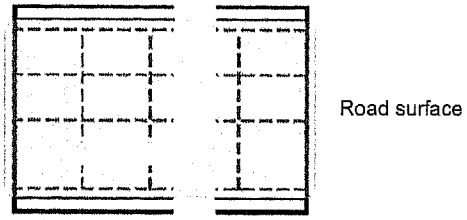
4) Substructures(pier, abuttment) and bearings

These shall be defined in each pier, abutment and bearing.



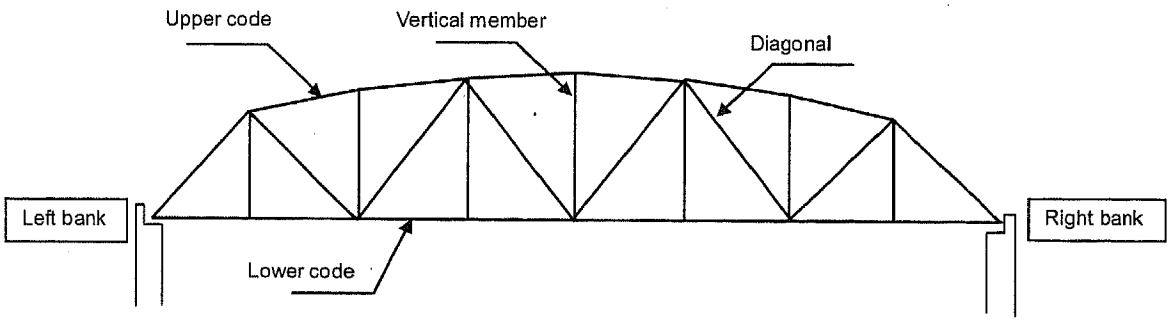
5) Road surface

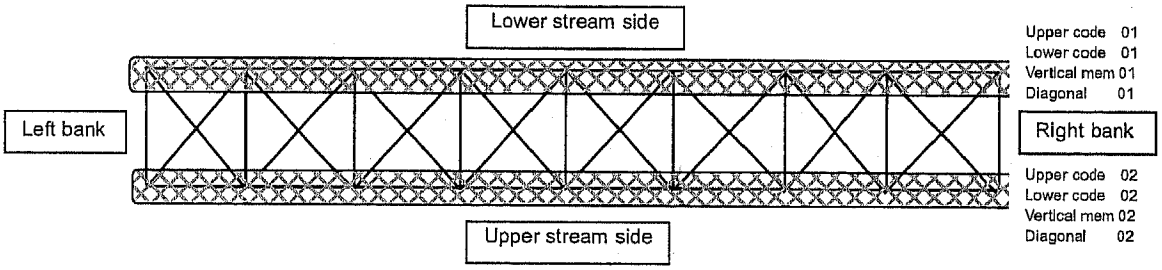
This shall be defined in a span.

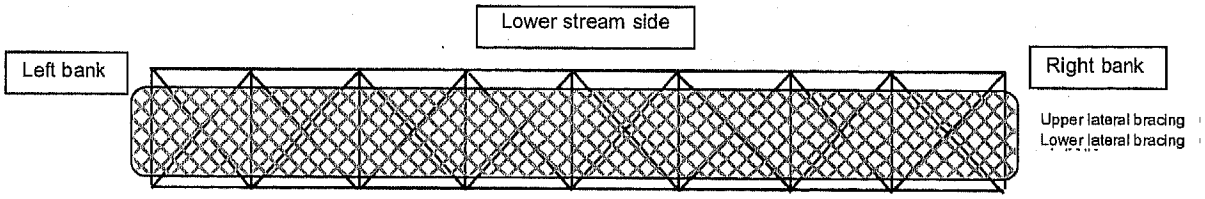


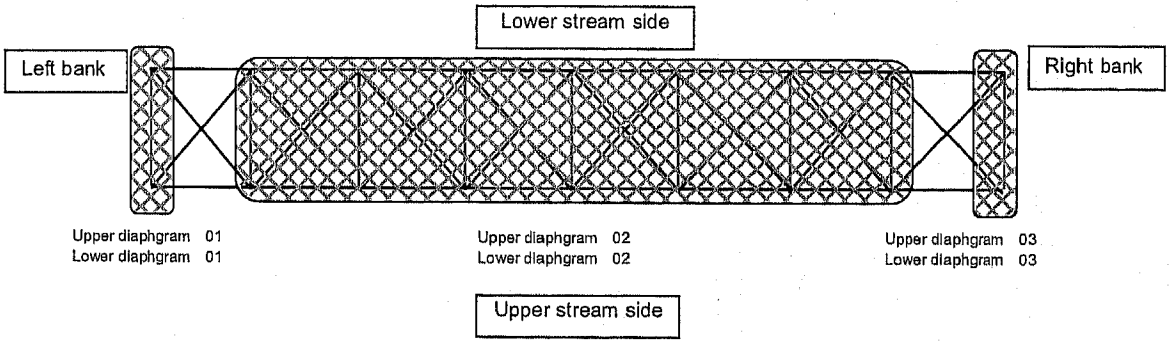
6) Truss member

In principle the same numbering rules shall be applied for the members of truss bridges as above from 1) to 5), however, the specific members for truss bridges shall be numbered as follows:









(4) Inspection result (1)

The classification of the inspected damages shall be recorded in the form for each span.

(5) Inspection result (2)

Damage location map and damage photo shall be recorded in the form for each span.

1) Damage location map

"Member No.", "damage type" and "photo No." of the inspected damages shall be recorded in the damage location map.

2) Damage photo

Corresponding photos to the inspected damages shall be attached.

a)Photo No.	: Corresponding No. to the photo (from left to right No.1, 2, 3 --)
b) Span No.	: Corresponding span No. to the photo
c) Inspection date	: The date when the photos are taken
d) Member No.	: Girder 01, Bearing 01, etc.
e) Damage	: Type of damage / Cracking, rebar exposure, etc.
f) Damage level	: Classification of damage / a - e
g) Note	: Supplementary explanation for the photos

The following damages need to be described besides damage and damage level in the note:

- Missing bolts

  Potential influence upon the third person shall be described.

- Cracking, water leakage and free lime (common to super- and substructures)

  In case of Classification of damage "c" :

  Distinction of "Crack width w = 0.2mm or not" and "Remarkably influential cracks upon structures or not"

- Deck cracking

  In case of Classification of damage "a" :

  Distinction of "Cracked or not"

- Damages in pavements

  In case of Classification of damage "a" :

  Distinction of "Cracked or not"

3.2 Recording forms and recorded examples

[Recording Forms]

Bridge Data

Recording Date										
Name of bridge			Name of road				Jurisdiction			
Location	From		Mile point	From			UTM coordinate			
	To			To						
Date in service			Live load				Specifications			
Bridge length		m	Number of span		span					
Type of superstructure			Type of substructure				Type of foundation			
Traffic condition	Year of traffic survey						Heavy vehicle ratio			
	Traffic						Load restriction			
Width of road	Total	m	Curb or Barrier	Sidewalk	Roadway / Lane	Roadway / Lane	Sidewalk	Curb or Barrier	Median zone	
	Effective	m	m	m	m	m	m	m	m	
Distance from coast			Emergency road				Priority route			
Condition under the road										
Overall view										

General View for Each Span			Span No.			Recording Date	
Name of bridge			Name of road			Jurisdiction	
Location	From		Mile point	From		UTM coordinate	
	To			To			

General view for each span	

Site Photo		Span No.		Recording Date	
Name of bridge		Name of road		Jurisdiction	
Location	From	Mile point	From	UTM coordinate	
	To		To		

Site Photo						
Photo No.		Inspection date		Photo No.		Inspection date	
Span No.		Note		Span No.		Note	
Description				Description			
Photo No.		Inspection date		Photo No.		Inspection date	
Span No.		Note		Span No.		Note	
Description				Description			

Members Numbering Scheme			Span No.			Recording Date	
Name of bridge			Name of road			Jurisdiction	
Location	From		Mile point	From		UTM coordinate	
	To			To			

Members Numbering Scheme	

Inspection Result(1)	Name of bridge		Span No.		Recording Date	

Name of bridge		Damage of steel members					Damage of concrete members						Others							Remarks
		Corrosion	Cracking	Missing bolts	Fracture	Deformation and loss	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 barriers	Damages in expansion joints	Damages in cable	
Girder	01																			
	02																			
	:																			
Stringer	01																			
	02																			
	:																			
Diaphragm	01																			
	02																			
	03																			
Sway bracing	01																			
	02																			
	03																			
Lateral bracing	01																			
	02																			
	:																			
Deck	01																			
	02																			
	:																			
Substructure	01																			
	02																			
Bearings	101																			
	102																			
	:																			
	201																			
	202																			
	:																			
Road surface																				
Pavement																				
Barriers Railings	01																			
	02																			
	03																			
	04																			
	:																			
Expansion joints	01																			
	02																			
	:																			
Others																				

Note: For "No Note: For "No." is that of remarkably influential cracks defined in the inspection & evaluation manual.

Inspection Result(2) :			Span No.			Recording Date	
Name of bridge			Name of road			Jurisdiction	
Location	From		Mile point	From		UTM coordinate	
	To			To			

Damage Location Map	

Inspection Result(2) :		Span No.		Recording Date	
Name of bridge		Name of road		Jurisdiction	
Location	From	Mile point	From	UTM coordinate	
	To		To		

Damage photo

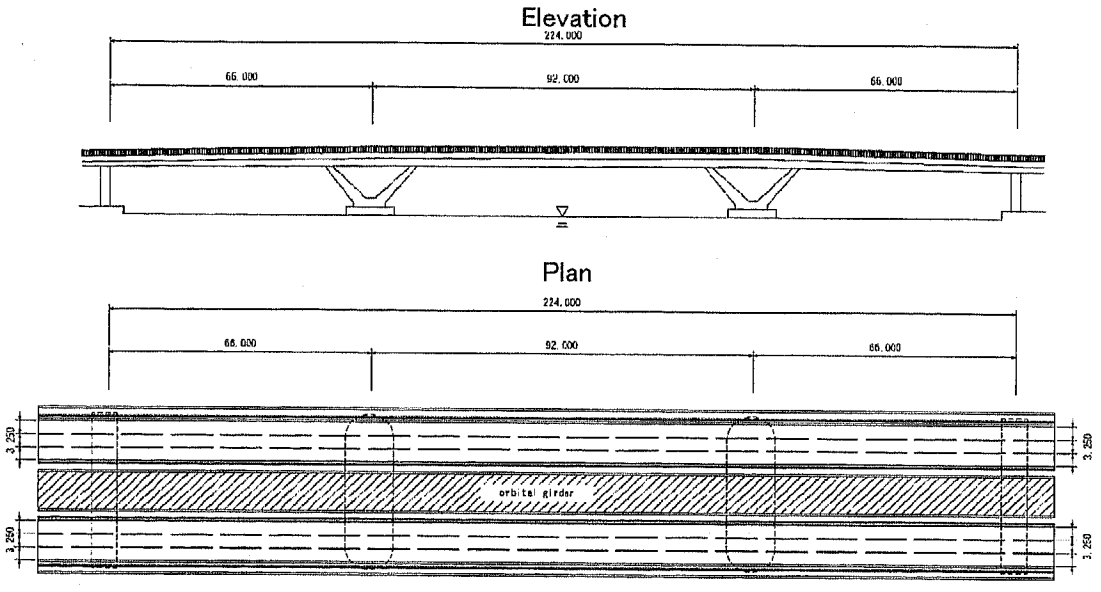
Photo No.		Span No.		Inspection date		Photo No.		Span No.		Inspection date	
Member name		Member No.		Note		Member name		Member No.		Note	
Damage		Classitication				Damage		Classitication			
Photo No.		Span No.		Shooting date		Photo No.		Span No.		Inspection date	
Member name		Member No.		Note		Member name		Member No.		Note	
Damage		Classitication				Damage		Classitication			

[Recorded Examples]

Bridge Data

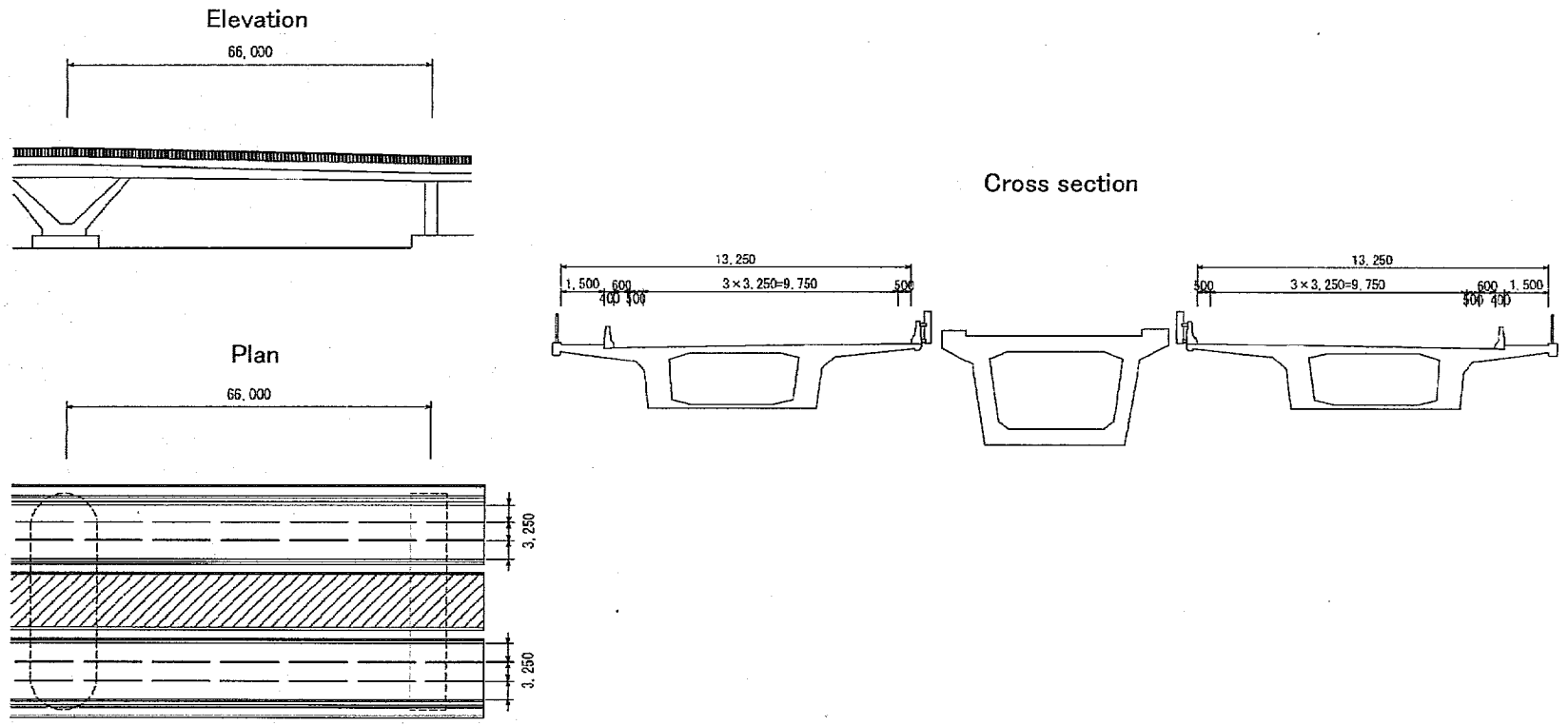
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)			Name of road				Recording Date	7/10/2010		
Location	From			Mile point	From			Jurisdiction	DRR		
	To				To			UTM coordinate			
Date in service	1982			Live load				Specifications	BS 5400		
Bridge length	224	m		Number of span	3	span					
Type of superstructure	PC-box girder			Type of substructure				Type of foundation			
Traffic condition	Year of traffic survey							Heavy vehicle ratio			
	Traffic							Load restriction			
Width of road	Total		m	Curb or Barrier	Sidewalk	Roadway / Lane		Roadway / Lane		Sidewalk	Curb or Barrier	Median zone
	Effective		m	m	1.6 m	3.25 m	3	3.25 m	3	1.6 m	m	m
Distance from coast				Emergency road				Priority route			
Condition under the road	Chao Phraya River										

Overall view



General View for Each Span			Span No.		3	Recording Date		7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road			Jurisdiction	DRR	
Location	From		Mile point	From		UTM coordinate		
	To			To				

General view for each span



Site Photo			Span No.	3	Recording Date	7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road		Jurisdiction	DRR
Location	From		Mile point	From	UTM coordinate	
	To			To		

Site Photo

Photo No.	1	Inspection date	6/10/2010
Span No.	3	Note	
Description	Side		

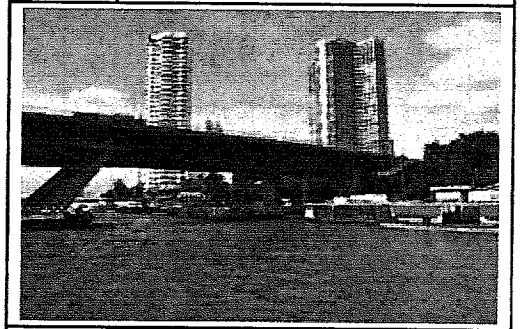


Photo No.	2	Inspection date	30/9/2010
Span No.	3	Note	
Description	Bottom		

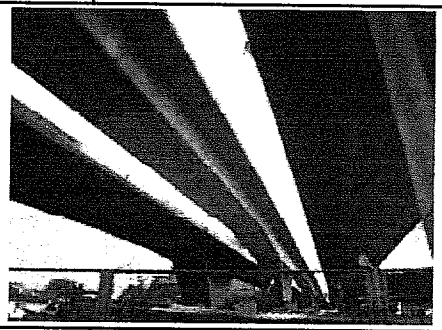


Photo No.	3	Inspection date	30/9/2010
Span No.	3	Note	
Description	Road surface		

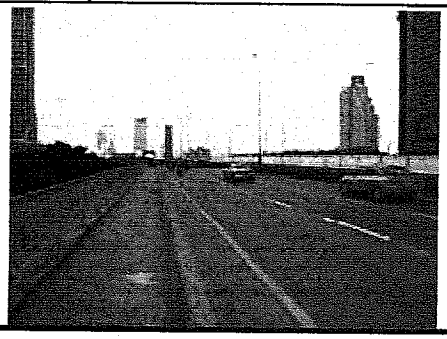
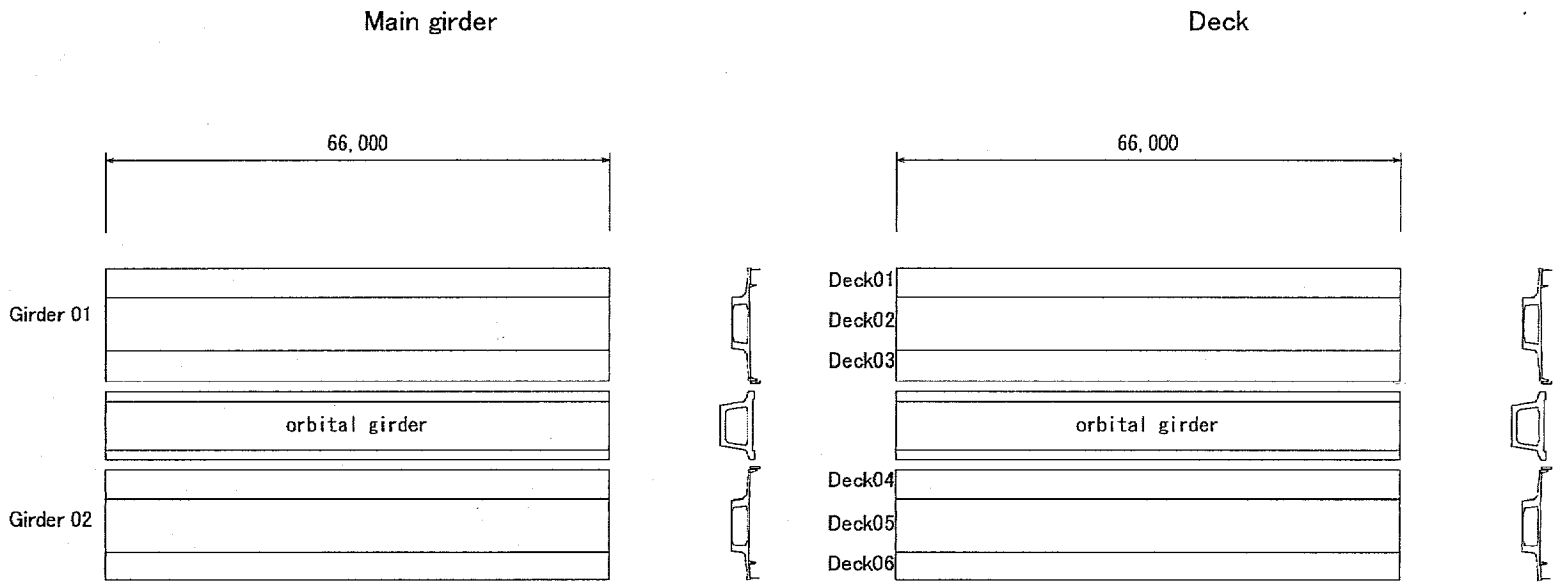


Photo No.		Inspection date	
Span No.		Note	
Description			

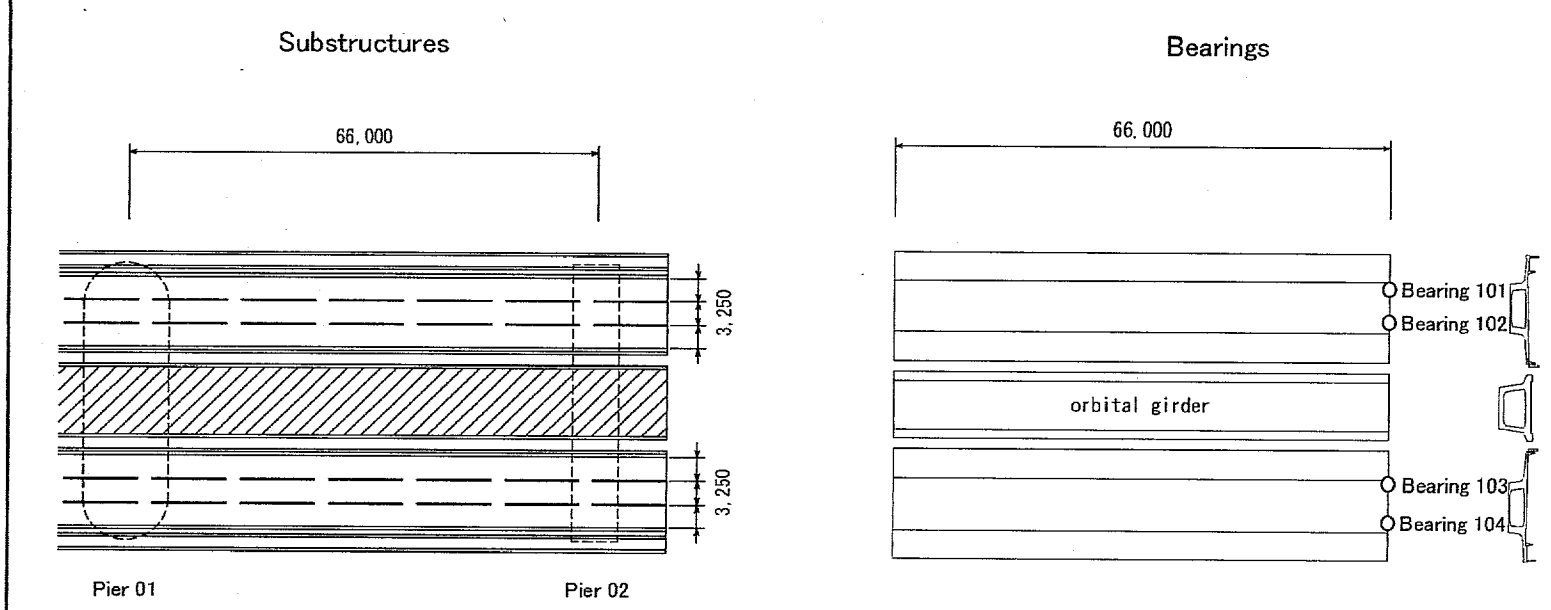
Members Numbering Scheme			Span No.		3	Recording Date	7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road			Jurisdiction	DRR
Location	From		Mile point	From		UTM coordinate	
	To			To			

Members Numbering Scheme



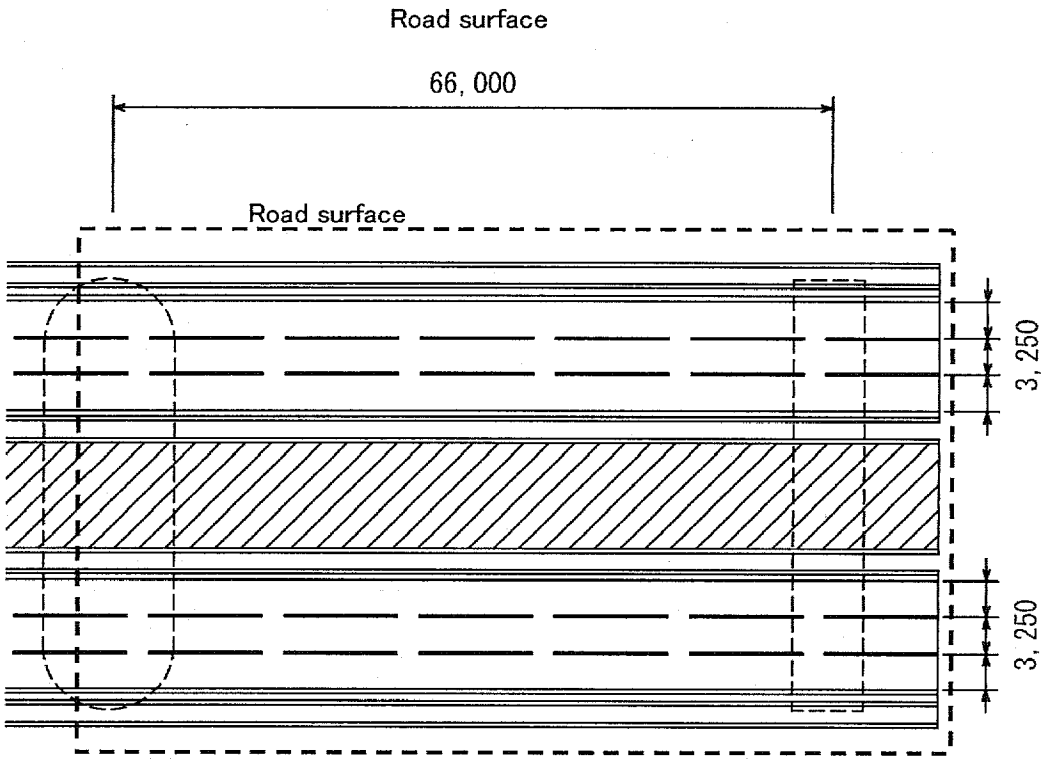
Members Numbering Scheme			Span No.		3	Recording Date	7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road			Jurisdiction	DRR
Location	From		Mile point	From		UTM coordinate	
	To			To			

Members Numbering Scheme



Members Numbering Scheme			Span No.		3	Recording Date	7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road			Jurisdiction	DRR
Location	From		Mile point	From		UTM coordinate	
	To			To			

Members Numbering Scheme



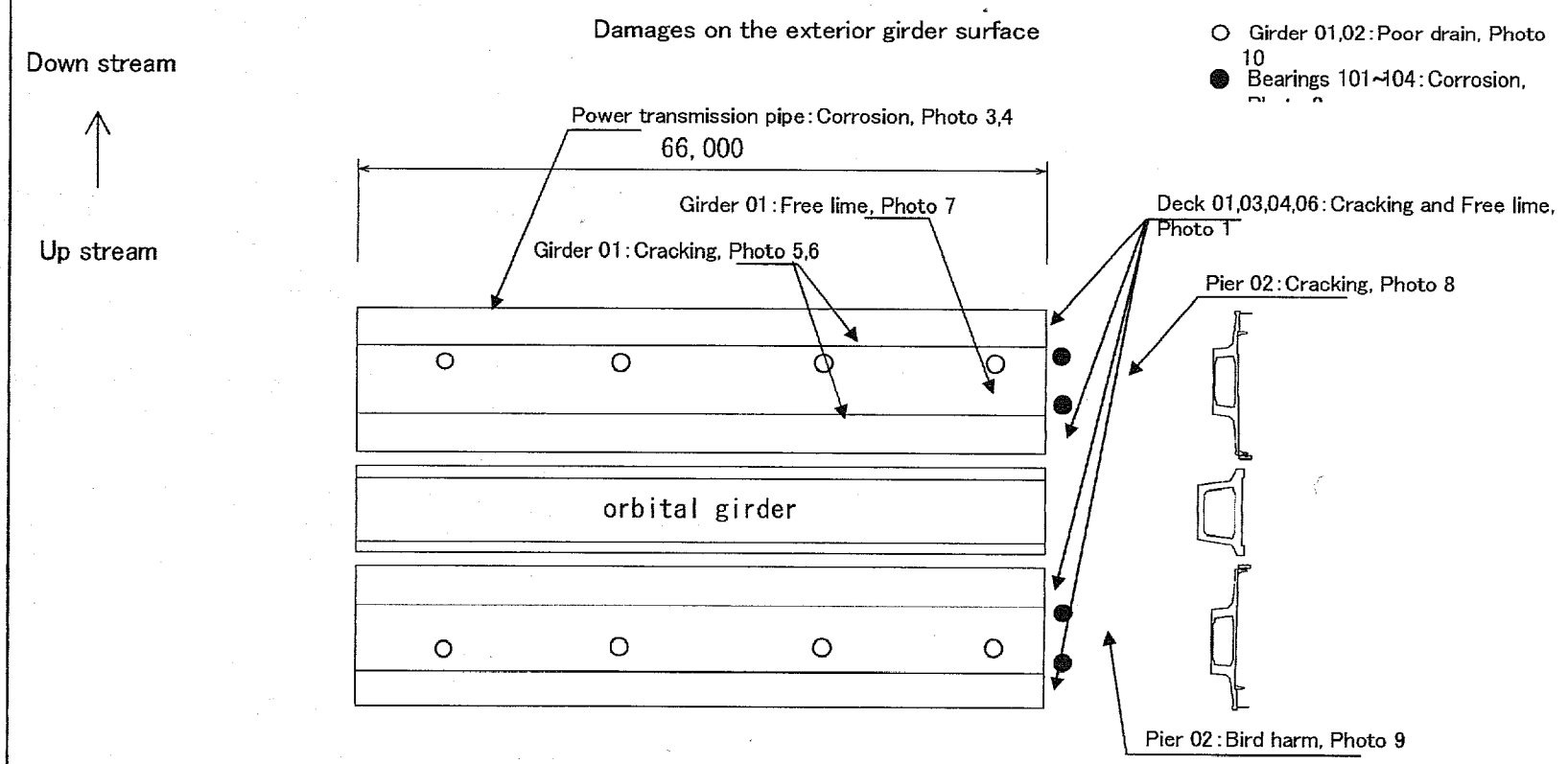
Inspection Result(1)		Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)3				Span No.						3	Recording Date	7/10/2010					
		Damage of steel members					Damage of concrete members						Others							Remarks
		Corrosion	Cracking	Missing bolts	Fracture	Deformation and loss	Cracking, Water leakage, Free lime	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 barriers	Damages in expansion joints	Damages in cable	
Girder	01						c	-	a			a								
	02						c	-	a			a								
Deck	01								a	a	c									
	02								a	a	a									
	03								a	a	c									
	04								a	a	c									
	05								a	a	a									
	06								a	a	c									
Pier	01						a	-	a						a					
	02						c	1	a						a					
Bearings	101													a						
	102													a						
	103													a						
	104													a						
Road surface													c							
Pavement																a				
Barriers Railings	01																c			
	02																c			
	03																a			
	04																a			
Expansion joints	01																	a		
Others																				

Note : For "No." is that of remarkably influential cracks defined in the inspection & evaluation manual.

Inspection Result(2) : Damages on the exterior girder surface(1)			Span No.		3	Recording Date	7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road			Jurisdiction	DRR
Location	From		Mile point	From		UTM coordinate	
	To			To			

Damage Location Map

Damages on the exterior girder surface



Inspection Result(2) : Damages on the exterior girder surface(2)			Span No.	3	Recording Date	7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road		Jurisdiction	DRR
Location	From		Mile point	From	UTM coordinate	
	To			To		

Damage photo

Photo No.	5	Span No.	3	Inspection date	30/9/2010
Member name	Girder	Member No.	01	Note	
Damage	Cracking	Classitication	c		

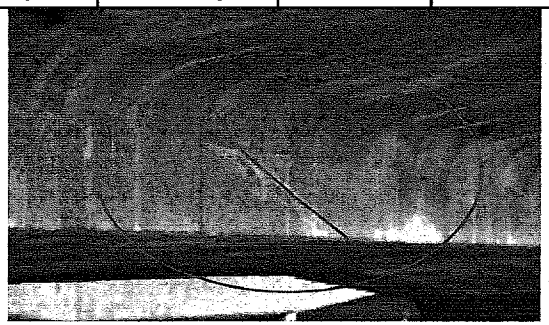


Photo No.	6	Span No.	3	Inspection date	30/9/2010
Member name	Girder	Member No.	01	Note	
Damage	Cracking	Classitication	c		

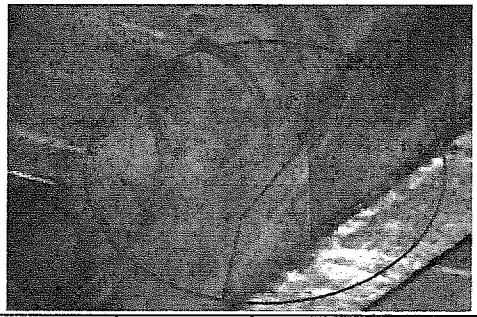


Photo No.	7	Span No.	3	Shooting date	30/9/2010
Member name	Girder	Member No.	01	Note	
Damage	Free lime	Classitication	c		

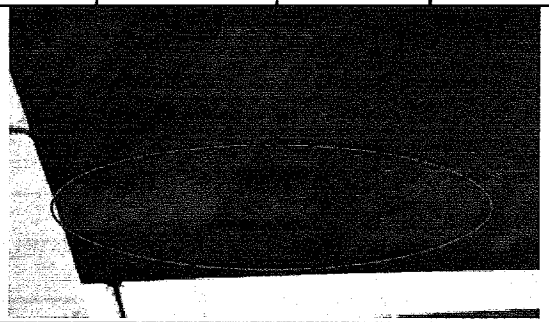
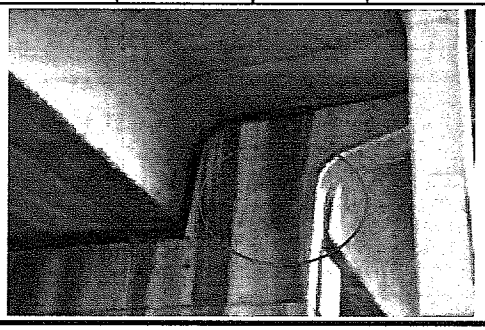


Photo No.	8	Span No.	3	Inspection date	30/9/2010
Member name	Pier	Member No.	02	Note	
Damage	Cracking	Classitication	c		



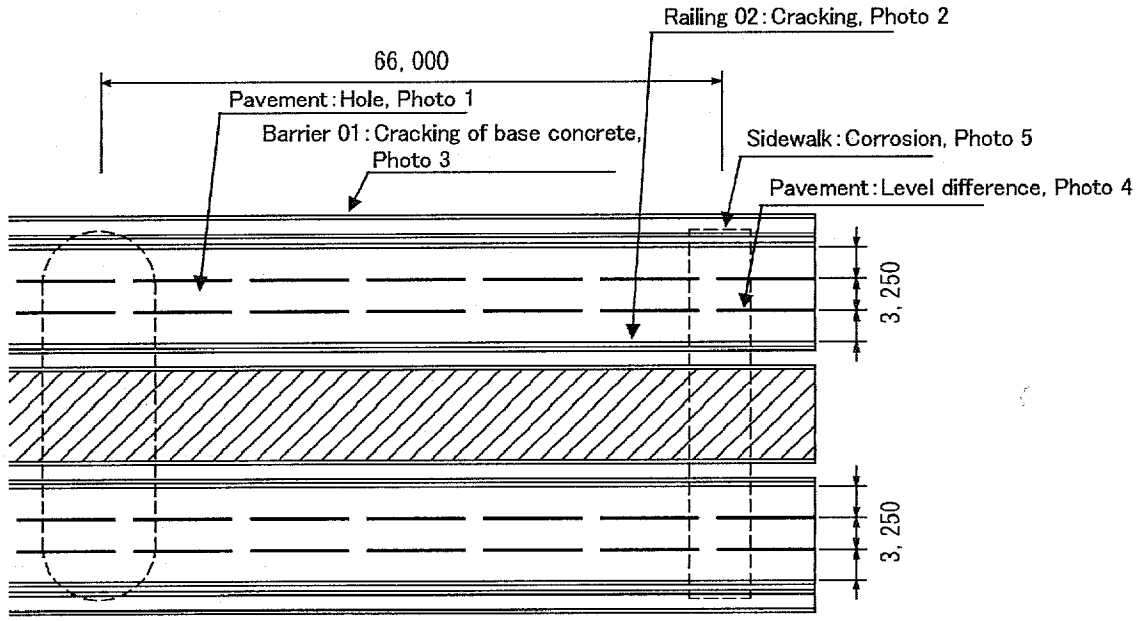
Inspection Result(2) : Damages on the Road Surface(1)			Span No.		3	Recording Date		7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road			Jurisdiction	DRR	
Location	From		Mile point	From		UTM coordinate		
	To			To				

Damage Location Map

Down stream

Up stream

Damages on the road surface



Inspection Result(2) : Damages on the Road Surface(2)			Span No.	3	Recording Date	7/10/2010
Name of bridge	Taksin (Bangkok-Thonburi2,Sathorn)		Name of road		Jurisdiction	DRR
Location	From		Mile point	From	UTM coordinate	
	To			To		

Damage photo

Photo No.	1	Span No.	3	Inspection date	30/9/2010
Member name	Pavement	Member No.		Note	
Damage	Hole	Classitication	a		

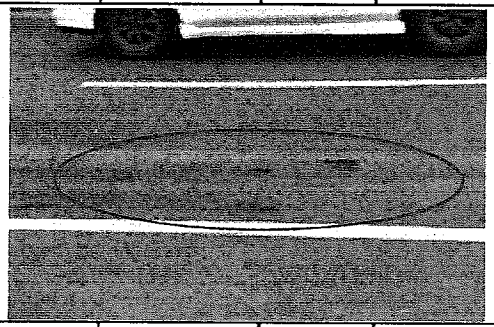


Photo No.	2	Span No.	3	Inspection date	30/9/2010
Member name	Railing	Member No.	02	Note	
Damage	Cracking	Classitication	c		

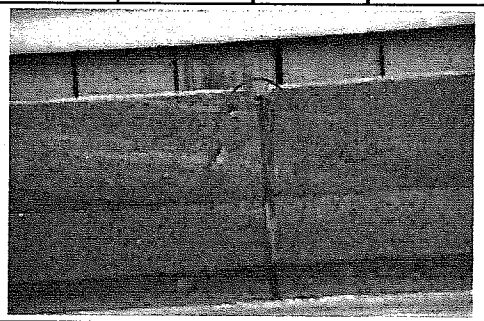


Photo No.	3	Span No.	3	Inspection date	30/9/2010
Member name	Barrier	Member No.	01	Note	
Damage	Cracking of base concrete	Classitication	a		

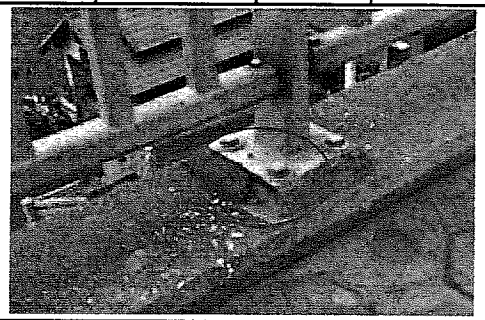


Photo No.	4	Span No.	3	Inspection date	30/9/2010
Member name	Pavement	Member No.		Note	
Damage	Level difference	Classitication	c