

Government of People's Republic of Bangladesh
Ministry of Road Transport and Bridges
Roads and Highways Department



Bridge Management System (BMS) Manual for Bridge Management Wing Final Draft

August 2018



PREFACE

It is a matter of great pleasure that **Bridge Management System (BMS) Manuals** have been developed by the consultants under the Bridge Management Capacity Development Project (BMCDP) of RHD with the cooperation of JICA.

RHD already has Bridge Maintenance Management System called BMMS constructed over 20 years ago, however it is impossible to carry out the bridge asset management developed under BMCDP because of shortage and unsuitable function of BMMS. Therefore, new system was required.

Bridge Management System (BMS) has been constructed in order to carry out effective bridge asset management with "database function of bridge basic data, result of inspection and result of evaluation" and "calculation function of priority to be remedy, rough cost estimate of each bridge."

The Bridge Management System (BMS) Manual 2018 is composed of 4 parts for each user authority level named as "for System Administrators", "for Bridge Management Wing", "for Inspector & Evaluator" and "for Public Users". The manuals show how to input information into BMS, how to use data of BMS, how to set settings of system and technical note to understand BMS for each user authority level.

Together with the systematic use of this BMS, this manual will be useful to the RHD field staff responsible for direct maintenance, the policy makers of RHD in this area and also the staff who will be involved in maintenance by contract.

We hope that this manual will assist in improving the understanding of the function of bridge structures and their long term durability and serviceability.

Finally, we would like to take this opportunity to thank the experts of JICA Consultant Team for their efforts in preparing the Bridge Management System (BMS) Manual 2018.



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1. BACKGROUND

1.1 Basic Policy

The policy to improve existing Bridge Maintenance Management System (called BMMS) to new Bridge Management System (called BMS) is described as follows.

First, JICA project team reviewed and analyzed existing BMMS to see if the modification of existing BMMS was possible or not although the set-up of upgraded BMMS will be accordance with JICA's instruction on this project and Record of Discussion.

When we found it impossible, we considered the set-up of New System will be set up based on Preventive Maintenance concept and some new functions such as selection of repair method, cost estimate, project priority are to be added.

1.2 Shortage of functions of BMMS

1) Observation result in BMMS sheet is unclear.

Types and extent of defect are not clearly defined, because there is only the evaluated defect of each element. Enough information should be included in BMM that all engineer can grasp and image the bridge soundness.

Information of defect / Photograph of the defects / Field sketch of the defects / Accumulation of past inspection result are to be itemized.

2) Shortage functions to carry out bridge asset management

There is only defect categories of bridge condition for assessment of bridges.

Rough cost estimate for rehabilitation or strengthening has already recorded, however basic information to calculate it are unclear (rehabilitation and strengthening strategy and its unit cost). Rough cost estimate should be calculated in accordance with rehabilitation and strengthening method, the extent of defects and the unit cost.

Bridge asset management should be carried out with the items of general road information like as road class, traffic volume, existence of detour and so on.

Therefore, function to calculate the priority of countermeasure in composite terms and function to select rehabilitation and strengthening method and rough cost estimate based on defect information will be proposed

We will examine possibility that upgraded BMMS can solve the problems.

1.3 Usability of BMMS

As result of reviewing by operating BMMS and examining past project (EBBIP), project team shows defects in usability of existing BMMS as follow.

- Operation is difficult, because of no user's manual.
- Filtering function is not enough to search under several conditions.

Example : When user want to search bridges following condition,

- Bridges condition is C or D on National road 5 or National road 6

Existing BMMS : inefficient

General

Location Chief Engineer [All] ▾ Chief Engineer, RHD [All] ▾

Bridge type Any

Road No N5 ▾ All National Regional Zilla Road

Overall Condition A B C D Any

No. of spans (between)

Overall Span Length (between)

Age (between)

Load restriction Yes No

Search

Output : 4 separate lists

One road No. can be set as filter.

A kind of condition can be set as filter.

User should search 4 times by following combinations.

N5+C / N5+D / N6+C / N6+D

If the user requires to sort all bridges fitting above condition,
the user should copy all information in 4 lists to EXCEL sheet and so on.

Example : Developed Filtering function

General

Location Chief Engineer [All] ▾ Chief Engineer, RHD [All] ▾

Bridge type Any

Road No N5 ▾ All National Regional Zilla Road

N6 ▾ All National Regional Zilla Road

Overall Condition A B C D Any

No. of spans (between)

Overall Span Length (between)

Age (between)

Load restriction Yes No

Search

Output : 1 list

Roads as same number as user needs can be set as filter.

Multiple options can be set as filter.

User can get a list recorded bridges fitting above condition by a search.

Search Result

Records Per page : 20 ▾

Search by structure name Go

Search Status

Record(s) found : 3916

Criteria BCS1 Condition :C

Photo function is almost dead.

Road No.	Chainage	Type	LRPName	Name	Length	BCS1	BCS2	BCS3	P.B.I. dt	P.B.I Photo
N1	8.976	PC Girder Bridge	LRP008b	KANCHPUR PC GIRDER BRIDGE	397	C	<u>1.044</u>	<u>1.044</u>		
N1	17.134	RCC Girder Bridge	LRP017b	Langalbandh Bridge.	159.52	C	<u>1.497</u>	<u>1.497</u>		
N1	18.742	PC Girder Bridge	LRP019a	MOLLIK PARA BRIDGE (R)	40.5	C	<u>1.4</u>	<u>1.4</u>		
N1	24.393	PC Box	LRP024a	MEGHNA BRIDGE	900	C	<u>1.9</u>	<u>1.9</u>		
N1	34.111	Box Culvert	LRP034c	BOCTAR KANDI BOX CULVERT	5.1	C	<u>1</u>	<u>1</u>		
N1	37.01	PC Box	LRP037a	Daud Kandi Bridge	1408.8	C	<u>0.5</u>	<u>0.5</u>		
N1	39.304	RCC Girder Bridge	LRP040b	Baldhakhal Bridge	23.1	C	<u>0.19</u>	<u>0.19</u>		
N1	39.304	RCC Girder Bridge	LRP040b	BALDHA KHAL RCC GIRDER BRIDGE	21.8	C	<u>2.7</u>	<u>2.7</u>		
N1	42.936	RCC Girder Bridge	LRP043a	Shahid Nagor Bridge	16.5	C	<u>0.645</u>	<u>0.645</u>		
N1	42.936	RCC Girder Bridge	LRP043a	SHAHID NAGIR	16.5	C	<u>20.96</u>	<u>20.96</u>		
N1	45.164	Box Culvert	LRP046a	SARKAR BARI CULVERT	3.9	C	<u>4.95</u>	<u>4.95</u>		
N1	46.871	Slab Culvert	LRP047a	AMIRABATH SLAB CULVERT	6.5	C	<u>2.77</u>	<u>2.77</u>		
N1	48.384	RCC Bridge	LRP049a	Ginlatoly	15.9	C	<u>5.78</u>	<u>5.78</u>		
N1	52.313	Box Culvert	LRP053a	ATTAL BANGA BOX CULVERT	4.5	C	<u>0.63</u>	<u>0.63</u>		
N1	56.006	RCC Girder Bridge	LRP056a	Ilici bazar Bridge	28.9	C	<u>0.117</u>	<u>0.117</u>		
N1	71.156	RCC Girder Bridge	LRP072a	Chandanian-Shahapara Bridge.	22.55	C	<u>0.181</u>	<u>0.181</u>		
N1	71.156	RCC Girder Bridge	LRP072a	CHANDINA- SHAHA PARA RCC GIRDER GRIDGE	23.1	C	<u>1.88</u>	<u>1.88</u>		
N1	78.382	Slab Culvert	LRP079a	KABILA DUBARCHAR SLAB CULVERT	1	C	<u>4.16</u>	<u>4.16</u>		
N1	87.713	RCC Girder Bridge	LRP088a	Dhanpur Bridge	22.85	C	<u>0.325</u>	<u>0.325</u>		
N1	91.092	RCC Girder Bridge	LRP092a	Paduar Bazar Bridge	35.97	C	<u>0.147</u>	<u>0.147</u>		

Page Total 3153.99

If the bridge doesn't have LRPname, it can't be inputted to BMMS.

User can't access to 11th to 195th page easily.

- Links to photo in list of search result are almost dead or have no photograph.
- History of construction year, contractor, previous inspections, previous rehabilitation measures, or any other issues are not recorded in BMMS.
- Without LRPName, input of bridge data is impossible. However, LRPName for all the bridges were not found on site during EBBIP.
- No provision is available for editing (add/erase/modify) of data in BMMS.

1.4 Result of hearing with BMMS Division and MIS

In September 2015, JICA project team interviewed with BMMS Division in Bridge Management Wing and MIS in Management Service Wing about the existing BMMS and we proposed the new functions to be added to existing BMMS. BMMS Division and MIS commented about the existing BMMS as follows,

- a) They do not have materials of existing BMMS (such as Original manual / Design specification / Source code and original data of first BMMS.)
- b) They agreed with the idea of proposed BMS (Bridge Management System, program developed existing BMMS) by JICA project team.
- c) They considered that it is impossible to update existing BMMS to new BMS due to lack of materials described above, a).

New program should be constructed instead of the upgrade of existing BMMS.

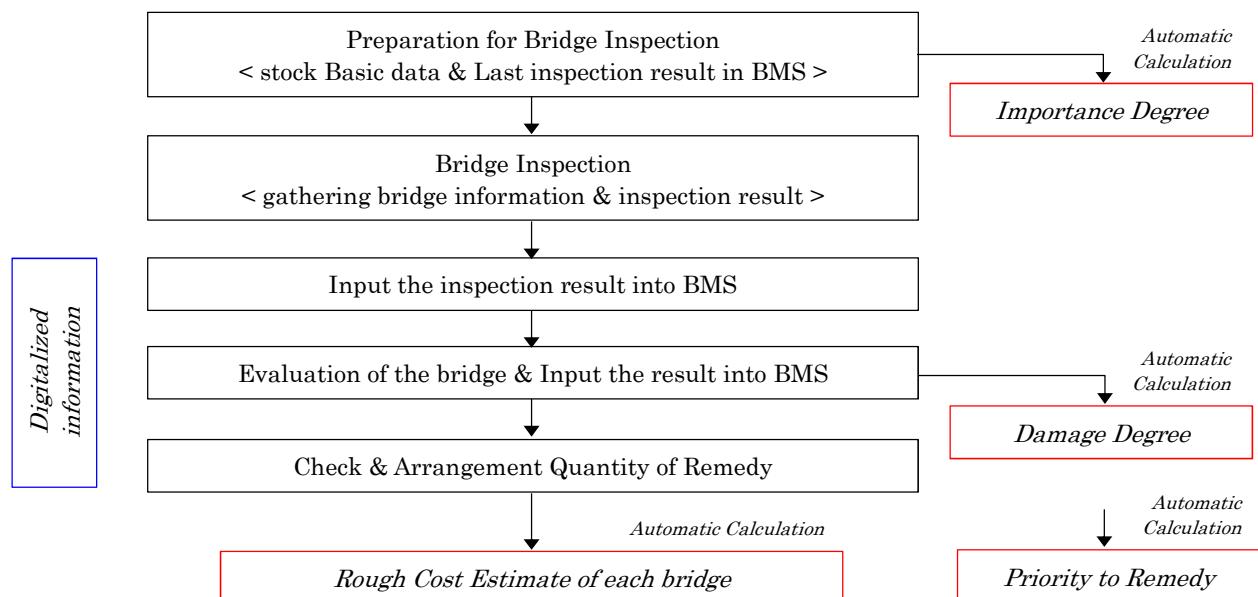
As the result of the interview, JICA project team decided to develop BMS as “New program”.

2. INTRODUCTION

2.1 Outline of BMS

The function of BMS in bridge asset management cycle is shown as following flowchart. Main purpose of BMS is consisted of following items,

- Database to accumulate bridge basic data and result of bridge inspection.
- “Priority to remedy the bridge” and “Rough cost estimate to remedy the bridge” are necessary to make budget plan. BMS calculates them based on Basic data, result of Inspection and result of Evaluation automatically. Priority to Remedy is score (0~100) and shown as total point of Importance degree and Damage degree. Importance degree shows influence to around area of the bridge when the bridge fall down or not exist. Damage degree shows health condition of the entire bridge.



2.2 Role of BMS

Role in BMS	Outline	Belonging
BMS System Admin	System engineer. He / She has all authority of BMS. Only he / she can operate Setting function of BMS.	BMW (HQ) system section
Data Entry Operator	System engineer. Main operation is adding, modifying or delete of Basic Data.	BMW (HQ) system section
Data Cross Checker	System engineer. Main operation is checking data inputted by Data Entry Operator.	BMW (HQ) system section
Inspector	After site inspection, he / she inputs result of the inspection and uploads photos into BMS.	Sub Div. office SAE
Senior Inspector	He / She checks inspection data inputted by Inspectors and gives approval to it or order to modify it.	Sub Div. office SDE
Chief Inspector	He / She takes responsibility for all inspection works and rough cost estimate to remedy the bridge.	Division office EE
Evaluator	After evaluation, he / she inputs the result into BMS, and arranges quantity of remedial measure.	Sub Div. office SDE
Appraisal Committee	The committee checks evaluation result of serious damaged bridge and give approval or order to modify.	AE of Zone / Circle and EE
BMW Admin	He / She can view all results in BMS.	BMW
RHD Officials	He / She can view results in BMS given permission by BMW Admin.	
Public User	He / She can view only limited basic data of bridges.	Non-official person

2.3 Manual of BMS

This manual describes the steps to configure the BMS for each user role. Because access authority and operation of each user role are different, “manual of BMS” consists multiple manuals for each role as following,

- Bridge Management system (BMS) Manual for System Administrators
- Bridge Management system (BMS) Manual for Inspector & Evaluator
- Bridge Management system (BMS) Manual for Bridge Management Wing
- Bridge Management system (BMS) Manual for Public User

You can refer “3.1 Roles Based Access in BMW” and “3.2 BMS function which Each User can Use” in order to know detail information of each role’s access authority

* Only for 1st Periodic Inspection in 2018, because the periodic inspection is first periodic inspection in Bangladesh and start-of BMS, the BMS doesn’t have Basic data of the bridges.

However, Basic data inputting operation has two problems peculiar to the starting up.

- Because number of Bridges in all Bangladesh is about 20,000, it is impossible to input basic data of the bridges by a few Data Entry Operator.
- Because old management system (BMMS) doesn’t have enough information to fill Basic data of BMS, user have to input temporary data into BMS in order to make blank inspection sheet before site inspection.

For first problem,

- Inspector (SAE in sub divisional office) inputs Basic data of bridges he / she inspects.
However, this rule applies to 1st Periodic Inspection only.

For second problem,

- “1st Periodic Inspection in Bangladesh- BMS Basic Data Temporary Input Manual” is prepared for inputting operation in 1st Periodic Inspection. You can refer this manual in APPENDIX of this manual.

2.4 Prerequisite Skills

- Data Entry Operator & Cross Checker should know the bridge related terminologies and computer typing with correct spelling.
- Bridge Inspectors should have proper knowledge on bridge inspection manual and how to input the inspection results in BMS.
- Bridge Evaluator should be familiar with the evaluation process as per Bridge Evaluation Manual, Bridge Remedial Measure and Bridge Remedy List Calculation methods.
- Public users do not require any specialized or additional technical skills to use the application. The only thing the user should have on how to use any browser like Mozilla Firefox or Google Chrome or Safari.

3. ROLE BASED ACCESS IN BMS

3.1 Role based access in BMS

S L	User	System Admin										Evaluation										Remedy Measure		Remedy list														
		Bridge Basic Data					Inspection					Data Entry Operator					Evaluation					Draft	Final	Hidden	Shown													
		Delete	View	Edit	Add	Access	Delete	View	Edit	Add	Delete	View	Edit	Add	Delete	View	Edit	Blank Sheets	Draft	Need Review	Need Approval	Unsigned	Final	Blank Sheets	Draft	Temporary Final	Recheck	Committee	Unsigned	Unsigned (Committee)	Final	Draft	Final	Hidden	Shown			
1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BMW Administration												User			
Committee Chair		Member of the committee				BMW officials				BMW Administration				User	
Delete	View	Edit	Add	Delete	View	Edit	Add	Delete	View	Edit	Add	Access			
-	-	-	-	-	-	-	-	-	-	-	-	Draft			
-	-	-	-	-	-	-	-	-	-	-	-	Need Cross Checking			
-	-	-	-	-	-	-	-	-	-	-	-	Final			
-	-	-	-	-	-	-	-	-	-	-	-	Blank Sheets			
-	-	-	-	-	-	-	-	-	-	-	-	Draft			
-	-	-	-	-	-	-	-	-	-	-	-	Need Review			
-	-	-	-	-	-	-	-	-	-	-	-	Need Approval			
-	-	-	-	-	-	-	-	-	-	-	-	Unsigned			
-	-	-	-	-	-	-	-	-	-	-	-	Final			
-	-	-	-	-	-	-	-	-	-	-	-	Blank Sheets			
-	-	-	-	-	-	-	-	-	-	-	-	Draft			
-	-	-	-	-	-	-	-	-	-	-	-	Temporary Final			
-	-	-	-	-	-	-	-	-	-	-	-	Recheck			
-	-	-	-	-	-	-	-	-	-	-	-	Committee			
-	-	-	-	-	-	-	-	-	-	-	-	Unsigned			
-	-	-	-	-	-	-	-	-	-	-	-	Unsigned (Committee)			
-	-	-	-	-	-	-	-	-	-	-	-	Final			
-	-	-	-	-	-	-	-	-	-	-	-	Draft			
-	-	-	-	-	-	-	-	-	-	-	-	Final			
-	-	-	-	-	-	-	-	-	-	-	-	Hidden			
-	-	-	-	-	-	-	-	-	-	-	-	Shown			

			L	S						
1	3	Public	User							
	Delete	View	Edit	Add	Access	Bridge Basic Data	Inspection	Evaluation	Remedy Measure	Remedy list
-	-	-	-	-	Draft	Need Cross Checking				
-	-	-	-	-		Final				
-	<	-	-	-						
-	-	-	-	-	Blank Sheets					
-	-	-	-	-	Draft					
-	-	-	-	-	Need Review					
-	-	-	-	-	Need Approval					
-	-	-	-	-	Unsigned					
-	-	-	-	-	Final					
-	-	-	-	-		Blank Sheets				
-	-	-	-	-	Draft					
-	-	-	-	-	Temporary Final					
-	-	-	-	-	Recheck					
-	-	-	-	-	Committee					
-	-	-	-	-	Unsigned					
-	-	-	-	-	Unsigned (Committee)					
-	-	-	-	-	Final					
-	-	-	-	-	Draft					
-	-	-	-	-	Final					
-	-	-	-	-	Hidden					
-	-	-	-	-	Shown					

3.2 BMS function which Each User can Use

SL	Function Category	SL	BMS Functions	BMS System Admin	BMS Data Entry Operator	BMS Data Cross Checker	Inspector	Sr. Inspector	Chief Inspector	Evaluator	Appraisal Committee	BMW Management	BMW Officials	Public User
1	Login, Logout	1	Login and logout the system	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
		2	Add digital signature	✓	-	-	✓	✓	✓	✓	✓	✓	-	-
2	Dashboard	3	BMS Dashboard	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
3	Bridge List	4	Add Bridge Basic Data	✓	✓	-	-	-	-	-	-	-	-	-
		5	View Bridge Basic Data	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		6	Edit Bridge Basic Data	✓	✓	✓	-	-	-	-	-	-	-	-
		7	Delete Bridge Basic Data	✓	-	-	-	-	-	-	-	-	-	-
		8	Export Bridge Basic Data in CSV	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-
		9	Prepare Bridge Inspection Sheet	✓	-	-	✓	✓	-	-	-	-	-	-
4	Bridge Inspection	10	Input Bridge Inspection Result	✓	-	-	✓	✓	-	-	-	-	-	-
		11	View Bridge Final Inspection Result	✓	-	-	✓	✓	✓	✓	✓	✓	✓	-
		12	Export Final Inspection Result in CSV	✓	-	-	✓	✓	✓	✓	✓	✓	✓	-

SL	Function Category	SL	BMS Functions	1 BMS System Admin	2 BMS Data Entry Operator	3 BMS Data Cross Checker	4 Inspector	5 Sr. Inspector	6 Chief Inspector	7 Evaluator	8 Appraisal Committee	9 BMW Management	10 BMW Officials	11 Public User
5	Bridge Evaluation	13	Add Temporary Evaluation Sheet	✓	-	-	-	✓	-	✓	-	-	-	-
		14	Input/Edit Evaluation Result	✓	-	-	-	✓	-	✓	-	-	-	-
		15	View Final Evaluation Result	✓	-	-	-	✓	✓	✓	✓	✓	✓	-
		16	Export Final Evaluation Result in CSV	✓	-	-	-	✓	✓	✓	✓	✓	✓	-
6	Bridge Remedial Measure	17	Edit Draft Remedial Measure	✓	-	-	-	✓	-	✓	-	-	-	-
		18	View Final Remedial Measure	✓	-	-	-	✓	✓	✓	✓	✓	-	-
7	Bridge Remedy List	19	View Bridge Remedy List	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
8	BMS Settings	20	Configure BMS Settings	✓	-	-	-	-	-	-	-	-	-	-
9	Activity Log	21	View Activity Log	✓	-	-	-	-	-	-	-	-	-	-
10	Tools	22	Import Bridge Basic Data	✓	✓	-	-	-	-	-	-	-	-	-

3.3 System Admin

BMS System Admin is the super user of BMS. This user has access to every feature available in BMS. BMS System Admin must configure the necessary BMS Settings to ensure the usability of BMS by other users.

SL	Features	Description
1	General Settings	Setup full application name. Example: Bridge Management System
		Setup short application name. Example: BMS
		Set time zone. Example: Asia/Dhaka [BDT +6:00]
2	Email Settings	Setup default email address, name and subject
		Configure SMTP Settings
3	Organization	Add organization into BMS
4	Offices	Add RHD office names into BMS
5	Designation	Add RHD employees official designation into BMS
6	Wings	Add all Wings names
7	Zone	Add all Zone names
8	Circles	Add all Circles names
9	Division	Add all Division names
10	Sub-Division	Add Sub-division names
11	Users	Add all user for BMS
12	Digital Signature	Insert digital signature for all user
13	Roles	Add and manage user roles for BMS use
14	Committee	Add and manage committee function in BMS
15	Bridge Basic Data	Setup all bridge basic data.
		Add category of bridge type. Example: Box Culvert etc.
		Add bridge/element types. Example: Bailey Bridge with Steel Deck, Concrete etc.
		Add primary/secondary components names
		Add material names
		Add elements names
		Input the name of crossings under bridges
		Input the name of public utilities
		Input traffic volumes
		Input bridge design standards
		Input live load conditions
		Input road classes
		Input measurement units

SL	Features	Description
16	Public safeties	Make a list of public safeties
		Make a list of Structural safeties
17	Defects	Add all defects name
		Add rating of defects
18	Defect Coefficients	Set the coefficients of defect, quantity and Rule for calculating quantity
19	Bridge Condition	Setup bridge evaluation category
		Setup overall bridge condition category
20	Bridge Configuration	Configure primary elements for every bridge types.
		Configure the element name for every element types
21	Bridge Remedial Measure	Input all remedial measure names
		Setup remedial measure for every defects of Ct and Dt evaluation category
22	Tools	Import bulk number of bridge data from excel sheet
		Download the excel format to fill-up bridge basic data before import
23	Activity Log	Monitor user activity in BMS

3.4 Data Entry Operator

After the required setup by BMS system Admin, the data entry operator are able to input bridge data into the system. Bridge data entry has three steps – 1) Draft, 2) Cross Checking and 3) Final. After data entry the operator send the data for cross checking to “data cross checker”. Before data entry consider the followings:

- Hints: Follow the hints given in the input field in light color text.
- Fields with red star (*) mark: This field is mandatory. User cannot proceed to next step if this field is empty.
- Fields with no star marks: This fields is optional. User can input value into this field anytime. But it is recommended not to keep this field empty.
- Dropdown: Select the appropriate value from dropdown list.
- Public View: Select this checkbox if the information is permitted for public view.

SL	Features	Description
1	Add New	Input bridge basic and public data
		Input bridge shape data
		Input bridge location info
		Input bridge road info
		Input and select bridge elements
		Upload bridge pictures
2	Draft	To save the bridge as draft use this action
3	Need Cross Checking	To send for cross checking use this action
4	Export	To download the bridge data use this action



User cannot edit final bridge data. BMS admin's consent will require before editing final data. Make sure all data are correct before saving it as final.

3.5 Data Cross Checker

Data cross checker checks the bridge basic data inputed by data entry operator. If any correction required, the user open the bridge in edit mode and do the necessary correction. After all corrections the bridge data can be set as final. This data is then used for other bridge operations like – inspection, evaluation etc. Final data cannot be changed or deleted if it is used in any other operations.

SL	Features	Description
1	Cross Checking	To get the bridge list for cross checking click the "Need Cross Checking" tab.
		For any correction open the bridge in edit mode
		To edit later click on this action to save it as draft
3	Save as Final	After all correction made click this action to save the bridge data as final



User cannot edit final bridge data. BMS admin's consent will require before editing final data. Make sure all data are correct before saving it as final.

3.6 Inspector (Inspector, Senior Inspector and Chief Inspector)

Inspection is very important feature in BMS. Bridge inspector creates inspection sheets. There are two types of inspection in current BMS – 1) Periodic Inspection and 2) Routine Inspection. The inspection process in BMS has 6 steps – 1) Blank Sheets, 2) Draft, 3) Submitted for Review, 4) For Approval, 5) Unsigned and 6) Final.

After creating inspection sheet the inspector can print it in hard copy, carry it to the inspection site and write down the results. This results then can be inputted into BMS. Inspection result input format is like below:

SL	Ratings	Description
1	a	No defect
2	b	Very small defect
3	c	Small defect
4	d	Medium defect. This input will require a picture of defects.
5	e	Large defect. This input will require a picture of defects.
6	-	Element does not exist
7	N	Not visible

Inspection steps:

SL	Features	Description
1	Prepare Inspection Sheet	Creates blank inspection sheets. These sheets are stored in "Blank Sheets" tab.
2	Blank Sheets	All blank sheets are stored under this tab in grid view. Click the icon under "Result Sheet" to open the file in edit mode.
3	Drafts (for Inspector)	All files saved as draft are stored under this tab. By default the "Submit for Review" button is disabled. 100% input is required before submitting the file for review. After 100% input at first save it as draft. Then reopen the sheet. Now the "Submit for Review" button will be enabled.
4	Submitted for Review (for Senior Inspector)	All files submitted for review will be stored under this tab. Only Authorized person can view this file. This file can be approved by the viewer or can be sent back for "Recheck". Files sent for recheck will go back to "Submitted for Review" tab.
5	For Approval (for Senior Inspector and Chief Inspector)	All files sent for approval will be stored under this tab. Only authorized user can see this file. User can send for "Recheck", or "Sign & Approve", or "Approve but Sign later" the files. User also can request "Detail Investigation" by clicking the check box.

SL	Features	Description
6	Unsigned (for Chief Inspector)	All approved but unsigned inspection sheets are stored under this tab. Only authorized user can access this file. User can also add digital signature.
7	Final	All signed and approved inspection sheets are stored under this tab. User cannot delete or edit this final sheets. These sheets are then used as reference data for evaluation result examination..
8	Export	Only authorized user can export the final inspection sheets.
9	Detail Investigation	Authorized user can upload detail investigation report. If any bridge requires detail investigation report then a "red" icon will show under action column.
10	Print	Authorized user can print any inspection sheets or results. There are two ways of printing - 1) Print single sheet 2) Print all sheets.
11	Digital Signature	Authorized user can add digital signature.
12	Comments	It is recommended to add comments in the comment box under each sheet.

3.6.1. Inspector

The Inspector will assist the inspection work under Senior Inspector.

On detection any defects or abnormality he will take record of the measurement result and practical defect/abnormality state using tools in compliance with the bridge inspection procedure. He will also take photographs and draw a field sketch of the defect.

In BMS, The inspector's part is as following,

- Inputting result of periodic inspection.
- Uploading scan data of field sketch and defect photos

3.6.2. Senior Inspector

The Senior Inspector will control the inspection team, with due attention paid on the safety control, and understands the activities of each personnel while keeping close contact with the assistant inspector during inspection and investigation.

In BMS, The Senior inspector's part is as following,

- Review inputted inspection result by the inspector.
- Giving approval to inspection result of small damaged bridges.

3.6.3. Chief Inspector

The Chief Inspector will take responsibility for all bridge inspection works and management program. Sometimes this roll may carry out by Assistant Chief inspector.

In BMS, The Senior inspector's part is as following,

- Review inputted inspection result of serious damaged bridges.
- Giving approval to inspection result of serious damaged bridges.

3.7 Evaluator

Evaluator creates evaluation sheets in BMS. There are five evaluation categories in BMS.

Evaluator can tick the correct category based on the inspection results. The categories are:

SL	Ratings	Description
1	At	No repair
2	Bt	Minor repair
3	Ct	Major repair
4	Dt	Emergency

Evaluation steps:

SL	Features	Description
1	Prepare Evaluation Sheet	Creates blank evaluation sheets. These sheets are stored in "Blank Sheets" tab.
2	Blank Sheets	All blank sheets are stored under this tab in grid view. Click the icon under "Result Sheet" to open the file in edit mode.
3	Draft	All files saved as draft are stored under this tab. By default the "Save as Temporary Final", "Save as Final" and "Submit to Committee" button is disabled. 100% input is required before saving as above condition. After 100% input at first save it as draft. Then reopen the sheet. Now the those buttons will be enabled.
4	Save as Temporary Final	After 100% inputting, user can save the sheet as Temporary Final. It is not necessary to set digitalized signature to save. Only authorized user can see this file.

SL	Features	Description
5	Save as Final	After 100% inputting, if the evaluation category Ct or Dt doesn't exist, user can save the result as Final with digitalized signature.
6	Submit to Committee	After 100% inputting, if evaluation category Ct or Dt exist, user have to submit the result to Appraisal Committee. Committee judges the result and chooses Save as Final or Recheck.
7	Recheck	If Appraisal committee doesn't approve the evaluation result, the result is sent back to Evaluator as Recheck. Evaluator considers it and sends modified result to committee again.
8	Final	All signed and approved evaluation sheets are stored under this tab. User cannot delete or edit this final sheets.
9	Export	Only authorized user can export the final inspection sheets.
10	Print	Authorized user can print any evaluation sheets or results. There are two ways of printing - 1) Print single sheet 2) Print all sheets.
11	Digital Signature	Authorized user can add digital signature.
12	Comments	It is recommended to add comments in the comment box under each sheet.

3.8 Appraisal Committee

The purpose of the Appraisal Committee is to ensure objectivity and transparency of bridge evaluation results, and to facilitate smooth approval procedure in Circle Office and Zone Office by the involvement of Circle Office and Zone Office staff.

3.9 BMW Administrators

BMW administrators can view all final results of bridge inventory data, inspection results, evaluation results, including the remedial measure and bridge remedy integrated list.

3.10 RHD Officials

RHD officials can view all final results of bridge inventory data, inspection results, evaluation results, including the remedial measure and bridge remedy integrated list after the permission of BMW administrators.

3.11 Public Users

Public users can view only permitted bridge basic data. Data entry operator and BMS admin manage this permissions with the consent of BMW Administrators.

4. RATING, DEGREE AND CATEGORY IN BMS

This chapter shows “rating and category to be inputted” and “degree and category calculated by BMS”. It is very important to understand the scores and categories in order to manage BMS. They are shown as following,

- (a) Rating of Defects : Result of Periodic inspection
- (b) Evaluation Category : Result of evaluation of Periodic inspection
- (c) Damage Degree : Score of health condition of the bridge
- (d) Bridge Condition Category : Category of health condition of the bridge
- (e) Importance Degree : Score of importance of the bridge around area
- (f) Priority to Remedy : Score of emergency level to remedy the bridge

(a) Rating of Defects

- Rating of Defects is result of Periodic inspection.
- Inspector records the rating on blank inspection sheet and input it into BMS.
- This rating shows Scale or Progress level of each defect.
- Shown as “**a, b, c, d, e**”.
- Defect marked as “e” is not always serious for the bridge soundness.
- Rating of Defects doesn’t show influence to structural soundness of the bridge.

(b) Evaluation Category

- Evaluation Category is result of Evaluation by Evaluator.
- This category shows Damage Level of each Element.
- Shown as “**At, Bt, Ct, Dt**”.
- Element categorized as “Dt” has lost its Functionality.
- If the element is “Primary Element”, the bridge is dangerous.

[e.g. Difference between Rating of defects and Evaluation Category]

Case : Human body with box have some Injury.

➤ Rating of Defects

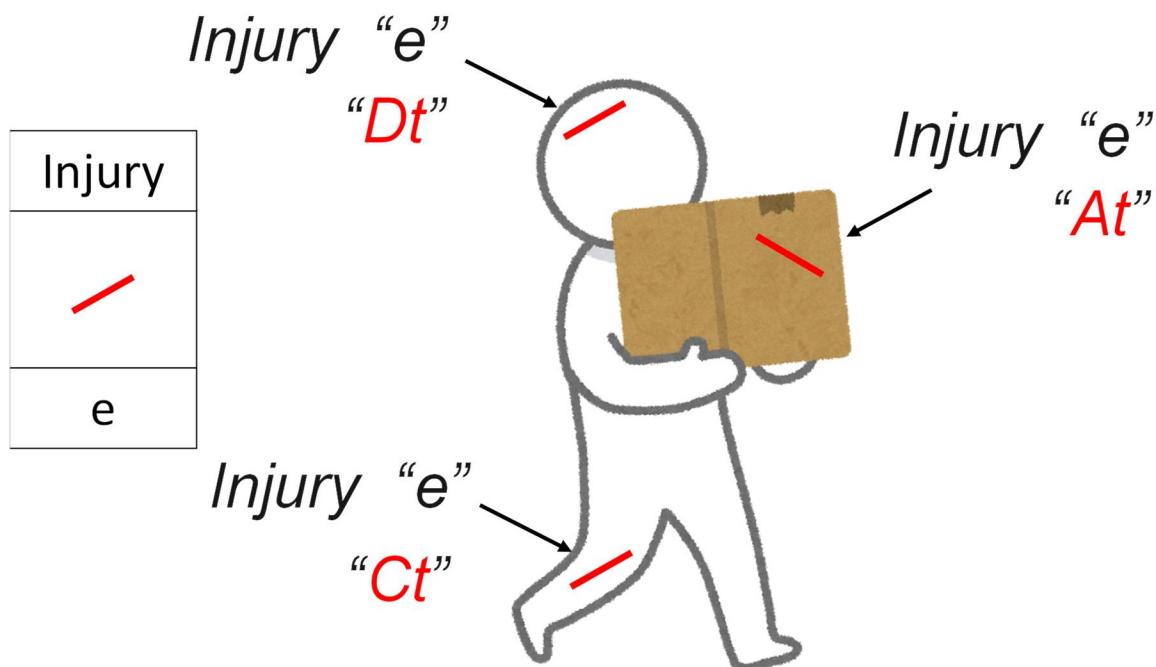
: Inspector only records “location and scale of defects” and “Rating of Defects” comparing with the defects and Inspection manual.

In this case, inspector records “there are three Injury rated “e” on head, foot and box.”

➤ Evaluation Category

: Evaluator evaluates whether the Injury is serious damage or not for Human body.

In this case, because Injury on head is very serious damage for Human body, Evaluator evaluated Category “Dt”. On the other hand, Injury on box is not influence to Human body. Therefore, Evaluation category of Injury on box is “At”.



(c) Damage Degree

- Damage Degree is calculated by BMS based on “Importance of the damaged Element”, “Risk of the Type of Defect at the element” and “Evaluation Result for the defect by Evaluator”.
- This category shows Health condition of the entire bridge.
- Shown as **“score Opt ~ 100pt”**. High score shows “the bridge is dangerous”.
- Damage degree is accumulated value calculated score of combination of “element and type of defects”.

[e.g. Calculation score of Corrosion on Steel Main Girder evaluated as “Bt”]

$$\begin{array}{c} \text{Coefficient of} \\ \text{Element} \\ \text{Main Girder} \\ \text{x1.00} \end{array} \times \begin{array}{c} \text{Coefficient of} \\ \text{Type of defect} \\ \text{Corrosion} \\ \text{x0.50} \end{array} \times \begin{array}{c} \text{Evaluated} \\ \text{degree} \\ \text{Bt} \\ \text{33 pt} \end{array} = 16.5\text{pt}$$

You can refer to “9.1 How to calculate Damage Degree” in order to get detailed information.

(d) Bridge Condition Category

- This category also shows Health condition of the entire bridge.
- Shown as **“A, B, C, D”**.
- This category is calculated by converting Damage Degree .

Damage Degree	Condition Category
0 to 20	A
21 to 60	B
61 to 80	C
81 to 100	D

(e) Importance Degree

- Importance Degree is Influence to around area of the bridge when the bridge fall down or not exist.
- This degree is calculated as higher because of “National road”, “heavy traffic volume”, “National road or railway go through under the bridge” and “no Detour”.
- Shown as **“score Opt ~ 100pt”**. High score shows “the bridge is dangerous”.
- Importance degree is accumulated value of scores set by above items.

(f) Priority to Remedy

- Priority to Remedy is emergency level to remedy the bridge.
- Because of limitation of each year budget, it is important to decide order to remedy bridges.
- Shown as **“score Opt ~ 100pt”**. High score shows “High emergency level”.
- Priority to Remedy is calculated as **“0.6 x Damage Degree + 0.4 x Importance Degree”**.

[e.g. Prioritization to remedy bridges]

- Bridge on National Road : Damage Degree = 60 Importance Degree = 80
- Bridge in deep mountain : Damage Degree = 80 Importance Degree = 10

If the priority is considered based on only Damage Degree, mountain bridge will be remedy first. However, it is better to remedy national road bridge at first for the around are, because many person use the bridge

In this case , Priority to Remedy of each bridge is

- Bridge on National Road : $0.6 \times 60 + 0.4 \times 80 = 36 + 32 = 64\text{pt}$
- Bridge in deep mountain : $0.6 \times 80 + 0.4 \times 10 = 48 + 4 = 52\text{pt}$

Therefore, national road bridge should be remedied at first.

5. BMS SETTINGS

This chapter shows settings function in BMS.

Only System Admin can access and arrange this function.

5.1 BMS

“BMS” in Settings function is setting for the basis of BMS as followings.

5.1.1. General Settings

In “General Settings”, System Admin can arrange name of this system and so on.

The screenshot shows the 'General Settings' page under 'GENERAL SETTINGS'. It has two tabs: 'General Settings' (selected) and 'Email Settings'. The 'General Settings' tab contains sections for 'Application' and 'Defaults'. In the 'Application' section, there are fields for 'Name of Application*' (Bridge Management System) and 'Short Name of Application*' (BMS). In the 'Defaults' section, there is a 'Default Timezone*' dropdown set to 'Asia/Dhaka [BDT +06:00]'. At the bottom are 'Update' and 'Reset' buttons. Red circles with numbers 1, 2, and 3 are overlaid on the screenshot to point to these specific fields.

SL	Name of Function	Remark
1	Name of Application	Enter this system name.
2	Short Name of Application	Enter short name of this system.
3	Default Timezone	Choose Time zone. (Asia/Dhaka)

5.1.2. Email Settings

In “Email Settings”, System Admin can set Email address of BMS and its SMTP Configuration.

5.2 RHD - Organization

“RHD - Organization” in Settings function is setting for the “Organization information”, “Office information” and “Designation information” of RHD.

Organization List																								
Organization		Offices	Designation	Actions																				
1	2	3		Edit	Delete	View	Add New																	
<p>Records per page: 50</p> <p>Search:</p>																								
<table><thead><tr><th>SI</th><th>Action</th><th>Full Name</th><th>Short Name</th><th>Website</th><th>E-mail</th><th>Contact Details</th><th>Description</th></tr></thead><tbody><tr><td>1</td><td>Edit Delete View</td><td>Roads and Highways Department</td><td>RHD</td><td>http://www.rhd.gov.bd/</td><td>info@rhd.gov.bd</td><td>Sarak Bhaban Tejgaon,...</td><td>The Roads and Highways...</td></tr></tbody></table>									SI	Action	Full Name	Short Name	Website	E-mail	Contact Details	Description	1	Edit Delete View	Roads and Highways Department	RHD	http://www.rhd.gov.bd/	info@rhd.gov.bd	Sarak Bhaban Tejgaon,...	The Roads and Highways...
SI	Action	Full Name	Short Name	Website	E-mail	Contact Details	Description																	
1	Edit Delete View	Roads and Highways Department	RHD	http://www.rhd.gov.bd/	info@rhd.gov.bd	Sarak Bhaban Tejgaon,...	The Roads and Highways...																	
<p>Showing 1 to 1 of 1 entries</p> <p>Previous 1 Next</p>																								

5.2.1. Organization

In “Organization”, System Admin can register organization like as RHD.

5.2.2. Offices

In “Offices”, System Admin can register office information like as Dhaka Division.

5.2.3. Designation

In “Organization”, System Admin can set designation name like as Sub Assistant Engineer.

5.3 RHD - Location

“RHD - Location” in Settings function is registration of “Wings” and “Offices”.

WING LIST					
Back Dashboard / Wings					
Wings	Zones	Circles	Divisions	Subdivisions	SAE
1	2	3	4	5	6
+ Add New					
Records per page <input type="text" value="50"/>					
Search: <input type="text"/>					
SI	Action	Wing Name	Address		
1		Bridge Management Wing	Sarak Bhaban, Tejgaon, Dhaka		
2		Project			
Showing 1 to 2 of 2 entries					
Previous 1 Next					

5.3.1. Wings

In “Wings”, System Admin can register organization information of Wing like as “Bridge Management Wing”.

5.3.2. Zones

In “Zones”, System Admin can register Zone offices. Each Zone office is made a connection with a Wing.

5.3.3. Circles

In “Circles”, System Admin can register Circle offices. Each Circle office is made a connection with a Zone office.

5.3.4. Divisions

In “Divisions”, System Admin can register Division offices. Each Division office is made a connection with a Circle office.

5.3.5. Subdivisions

In “Subdivisions”, System Admin can register Subdivision offices. Each Division office is made a connection with a Division office.

5.3.6. SAE

In “SAE”, System Admin can register information of Sub Assistant Engineer. Each SAE is made a connection with a Subdivision office.

5.4 Users

“Users” in Settings function is registration of “User information”.

SI	Action	Photo	Employee ID	Full Name	Designation	Office
1			RHD-126	Zulfiqar Ahmed	Executive Engineer	Ch
2			RHD-141	Zahirul Islam	Executive Engineer	Lt

5.4.1. Users

In “Users”, System Admin can register User information like as “Employee ID”, “Full Name”, “Office”, “Email”, “Mobile phone number” and “User Role in BMS”.

5.4.2. Set Digital Signature

In “Set Digital Signature”, System Admin can register Image file of digital signature for registered users.

5.5 Role

“Role” in Settings function is setting for “Role Name in BMS” and “its Access Control”

The screenshot shows the 'ROLE EDIT' interface. At the top, there are navigation links: Back, Dashboard, Roles, and Edit. Below this, a 'Role' tab is selected. The 'Role Name*' field contains 'System Admin' and is highlighted with a red circle labeled '1'. The 'Description' field contains 'BMS System Administrator'. Below the description is a note 'Remaining Characters 176'. The main area is titled 'Access Control List' and is highlighted with a red circle labeled '2'. It shows a grid of modules and their functions. For 'Dashboard', 'Bar Chart' and 'Bridge By Subdivision' are checked. For 'Bridge', 'Add' and 'Inventory View' are checked. For 'Inspections', under 'Periodic Inspection', 'New Sheet', 'Inspection Form', and 'Periodic Approved' are checked. Under 'Routine Inspection', none are checked. The columns are labeled '#', 'Module', and 'List'.

#	Module	List
1	Dashboard	<input checked="" type="checkbox"/> Bar Chart <input checked="" type="checkbox"/> Bridge By Subdivision
2	Bridge	<input checked="" type="checkbox"/> Add <input checked="" type="checkbox"/> Inventory View
3	Inspections	<input checked="" type="checkbox"/> Periodic Inspection <input checked="" type="checkbox"/> New Sheet <input checked="" type="checkbox"/> Inspection Form <input checked="" type="checkbox"/> Periodic Approved <input checked="" type="checkbox"/> Routine Inspection

SL	Name of Function	Remark
1	Role Name	Enter the name of role.
2	Access Control List	Click the check box of enable function for the roll. You can refer 3. ROLE BASED ACCESS IN BMS In this manual.

5.6 Committee

“Committee” in Settings function is registration of “Committee information”.

5.7 Bridge Basic Data

“Bridge Basic Data” in Settings function is setting for “Basic Data in Bridge List” and “calculation of Importance Degree”.

SL	Name of Function	Remark
1	Bridge Type Category	Set category of bridge type with its material.
2	Types	Set “Bridge Type” and “Type of Element”. Type of elements are required for pull-down menu in Element tag of Bridge List.
3	Components	Set “Components of bridge”. Each component requires to set as Primary or Secondary category.
4	Materials	Set “Material” like as steel or concrete.
5	Elements	Set “information of Element Type”. Each Element requires Weight Coefficient to calculate Damage Degree.
6	Crossing Under Bridge	Set “condition of Crossing under bridge”. Each condition requires Point to calculate Importance Degree.
7	Crossing / Utility	Set “type of Crossing under the bridge and Utility pipe or wire”. This information are required for pull-down menu in Basic Info tag of Bridge List.
8	Traffic Volume	Set “range of Traffic Volume”. Each range requires Point to calculate Importance Degree.
9	Design Standards	Set “name of Design Standard”.
10	Live Load Conditions	Set “name of Live Load Conditions”.
11	Road Classes	Set “name of Road Classes”. Each class requires Point to calculate Importance Degree.

SL	Name of Function	Remark
12	Road No.	Set “Road No.” like as N1 or Z1001.
13	Measurement Unit	Set “Measurement Unit” like as Meter or Point,

5.8 Bridge Safety

“Bridge Safety” in Settings function is setting for “Public Safeties” and “Structural Safeties”. Those type of safeties are special condition of defect type. Current system doesn’t refer this information.

5.9 Bridge Defects

“Bridge Defects” in Settings function is setting for “26 types of Defects” and “Rating of Defects”.

SI	Action	Defect Name	Order	Material	Description
1	Eye icon	Corrosion	1	Steel	Corrosion
2	Eye icon	Crack in Steel	2	Steel	Crack in Steel
3	Eye icon	Loose or Missing Bolts	3	Steel	Loose or Missing Bolts
4	Eye icon	Fracture	4	Steel	Fracture
5	Eye icon	Deterioration of Paint System	5	Steel	Deterioration of Paint System
6	Eye icon	Crack	6	Concrete	Crack of concrete member
7	Eye icon	Spalling /Exposed Rebar	7	Concrete	Spalling /Exposed Rebar
8	Eye icon	Water leakage/ Efflorescence	8	Concrete	Water leakage/ Efflorescence
9	Eye icon	Fallen out of Deck Slab	9	Concrete	Fallen out of Deck Slab
10	Eye icon	Cracking of Deck Slab	10	Concrete	Crack of Deck Slab

SL	Name of Function	Remark
1	Defects	Set 26 types of defects. Each type of defects requires to set grouping of Material (Steel, Concrete and Others)
2	Rating of Defects	Set “Rating of Defects” for result of Inspection. This information is required for pull-down menu in Inspection Sheet.

5.10 Bridge Coefficient

“Bridge Coefficient” in Settings function is setting combinations of “Bridge Type”, “Elements” and “Type of Defects”. “Defect coefficient” to calculate Damage Degree and “Quantity coefficient and formula” to calculate remedy quantity are also set here.

All combinations of bridge type and element should be set the information with this function.

ELEMENT TYPE, DEFECTS AND COEFFICIENT CONFIGURATION

Back | Dashboard / Element Type, Defects and Coefficient Configuration

Element Type, Defects and Coefficient

Bridge Type Steel Girder Bridge 1

Elements 2

Main Girder

Steel Girder Bridge (Bridge Type) - Main Girder (Element) - Defects

Steel	Defect	Defect coefficient	Quantity coefficient	Quantity Rule No. for Ct	Quantity Rule No. for Dt
	Ct	Dt			
<input checked="" type="checkbox"/> 1. Corrosion	0.60	3.00	3.00	209	209
<input checked="" type="checkbox"/> 2. Crack in Steel	1.00	1.00	1.00	(Height of Main Girder x 2) + (Width of Main Girder x 2)	(Height of Main Girder x 2) + (Width of Main Girder x 2)
<input checked="" type="checkbox"/> 3. Loose or Missing Bolts	0.20	Quant	Quant	101	101
			Fix	-- Select --	Fix
					-- Select --

SL	Name of Function	Remark
1	Bridge Type	Choose targeted bridge type.
2	Elements	Choose targeted elements of the bridge type.
3	Defects	Click check box of enable defects for the combination of bridge type and element.
4	Defect Coefficient	Set coefficient to calculate Damage Degree.
5	Quantity Coefficient	Set coefficient to calculate Remedy quantity for Evaluation category Ct, Dt or both.
6	Quantity Rule No.	Choose basic formula No. to calculate Remedy quantity for Evaluation category Ct, Dt or both.

5.10.1. How to Add new Quantity Rule for Ct and Dt

To make this modification system admin needs access permission of the source code. Open the source file /application/config/bms_config.php from the http root. There are two sections of the code – one for Ct and another for Dt.

```
/** Quantity rule list for ct **/
$config['quantity_rules_no_ct'] = array(
    '101' => 'Fix',
    '102' => 'Span Length',
    '103' => 'Effective Width',
    '104' => 'Effective Width x Span Length',
    '105' => 'Bridge Width',
    '201' => 'Interval of Main Girder',
    '202' => 'Interval of Main Girder x Span Length',
    '203' => 'Height of Main Girder x Interval of Main Girder',
    '204' => 'Width of Main Girder x Span Length',
    '205' => '(Height of Main Girder x Width of Main Girder) x Span Length',
    '206' => '((Height of Main Girder x 2) + Width of Main Girder) x Span Length',
    '207' => '((Height of Main Girder x 2) + (Width of Main Girder x 3)) x Span Length',
    '208' => '((Height of Main Girder x 2) + (Width of Main Girder x 4)) x Span Length',
    '209' => '(Height of Main Girder x 2) + (Width of Main Girder x 2)',
    '301' => 'Span Length x Width of Culvert',
    '302' => 'Span Length x Height of Side Wall',
    '303' => 'Width of Culvert x Height of Side Wall'

);
```

Follow the same steps to add new quantity formula for Dt. This section of code will be found below this code.

5.11 Bridge Condition

“Bridge Condition” in Settings function is setting of 2 types of category, “Evaluation Category” and “Entire Bridge Condition category”.

SI	Action	Category	Damage Degree	Expected Countermeasure
1		A	0~20	
2		B	21~60	
3		C	61~80	
4		D	81~100	

SL	Name of Function	Remark
1	Evaluation Category	At, Bt, Ct, Dt and N are category to evaluate in evaluation sheet. Evaluated degree is score to calculate Damage Degree. System Admin can arrange them by clicking edit icon.
2	Overall Bridge Condition Category	A, B, C, D are category to show entire bridge condition. Damage Degree is converted to this category based on range shown as “Damage Degree” in the table. If System Admin changes range of “Damage Degree” (e.g. changing from B:21~60 to B:31~70), it is necessary to access to source code.

5.12 Bridge Configuration

“Bridge Configuration” in Settings function is setting for Element tab of Bridge List.

SL	Name of Function	Remark
1	Bridge Type & Element	Setting for combination of elements for each bridge type in Element tab of Bridge List.
2	Element & Element Type	Setting for material pull-down menu in Element tab of Bridge List.
3	Bridge Type Name	Choose targeted bridge type.
4	Mandatory Input fields	Choose targeted element type for each component. Check box of the element becomes always enable. (The element is always required by the bridge type.)
5	Manual Input fields	Choose targeted element type for each component. User can choose enable or not enable of the element. (The element is sometimes required by the bridge type.) User can't choose elements not included in “Mandatory Input fields” or “Manual Input fields”.

ELEMENT & ELEMENT TYPE CONFIGURATION

[Back](#) | [Dashboard](#) / Element & Element Type Configuration

Bridge Type & Element Element & Element Type

Element Type Deck Slab (Concrete) 1

Deck Slab (Concrete) - Types x RC x PC x Concrete 2

Cancel

SL	Name of Function	Remark
1	Element Type	Choose targeted element type.
2	Material and construction type	<p>Choose targeted material or construction type in order to show in pull-down menu in Element tab of Bridge List.</p> <p>If the element doesn't require to set material or construction type (pull-down is not necessary), this cell should be blank.</p> <p>The pull-down menu with material or construction type is necessary to create Inventory Sheet.</p>

5.13 Bridge Remedy Measure

“Bridge Remedy Measure” in Settings function is setting for “Bridge Remedial Measure”.

REMEDIAL MEASURE LIST

Back | Dashboard / Remedial Measure

Remedial Measures Element, Defects and Remedial Measures

1 2 3

Records per page 10 Add New Search:

SI	Action	Name	Code	Unit	Unit Cost	Order	Description
1		Supplementing Steel Plate	10	m2	75,045.00	10	
2		Repainting of Steel Member	11	m2	2,323.00	11	
3		Stop hole+Supplementing Steel Plate	12	m2	75,045.00	12	

SL	Name of Function	Remark
1	Remedial Measures	Registration of remedy measures with its unit cost.
2	Element, Defects and Remedial Measures	Setting for combination of “element type”, “type of defects”, “Evaluation Category Ct or D” and “Remedy Measure”.
3	Remedial Measure table	Set remedy measure name and unit cost information.

ELEMENT, DEFECTS AND REMEDIAL MEASURES CONFIGURATION

Back | Dashboard / Element, Defects and Remedial Measures Configuration

Remedial Measures Element, Defects and Remedial Measures

1

Main Girder

Main Girder (Element) - Defects

Steel

Defect Ct (Remedial Measure) Dt (Remedial Measure)

1. Corrosion 11. Repainting of Steel Member 10. Supplementing Steel Plate

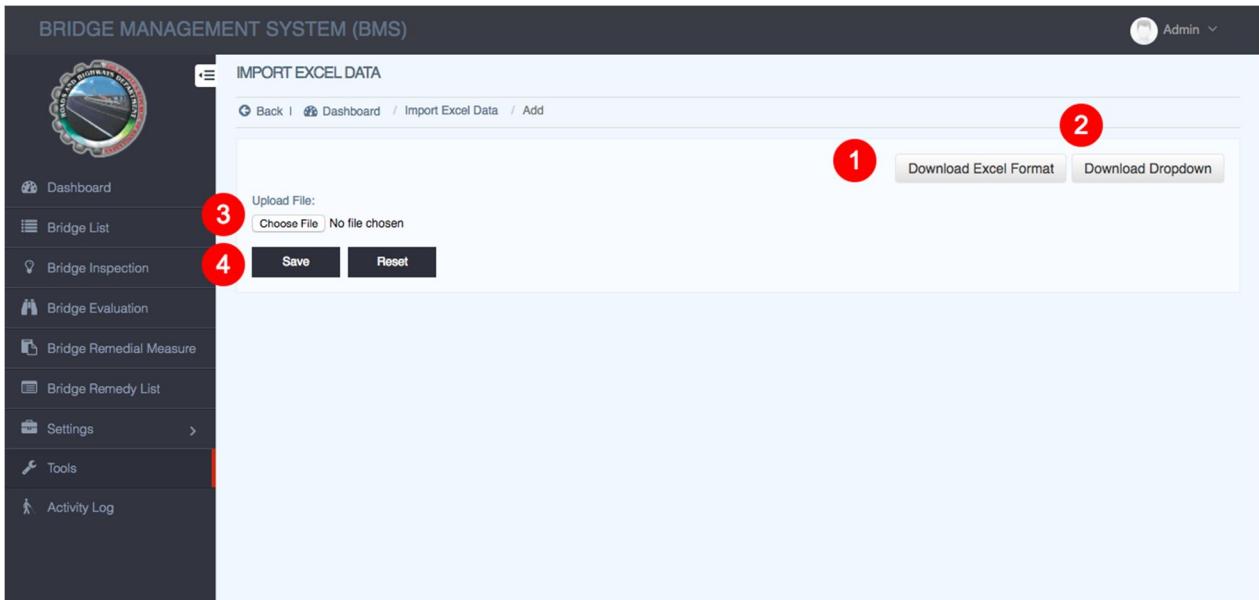
2. Crack in Steel 12. Stop hole+Supplementing Steel 12. Stop hole+Supplementing Steel

SL	Name of Function	Remark
1	Elements	Choose targeted element.
2	Defects	Click the check box to enable the defect.
3	Evaluation category and Remedial Measure	Choose Remedy measure for Evaluation category Ct and Dt of each type of defect.

5.14 Tools / Activity Log

5.14.1. Tools

This feature is used to upload bulk bridge data into BMS database. User must download the templates first then input all necessary data into excel file and upload both sheets.



1. First download **Bridge basic data format template**.
2. Second download **Bridge basic related settings data**.
3. Upload both files.
4. Click “**Save**” to insert the data in database.

5.14.2. Activity Log

This feature is used to track the activity log.

ACTIVITY LOG				
Back Dashboard / Activity Log				
Records per page		50	1	Search:
SI	Activity	Activity Time	Module	User Name
1	List view	2017-07-08 16:37:12	Remedial_measures	Admin (System Admin)
2	List view	2017-07-08 16:35:54	Remedial_measures	Admin (System Admin)

1. View activity log

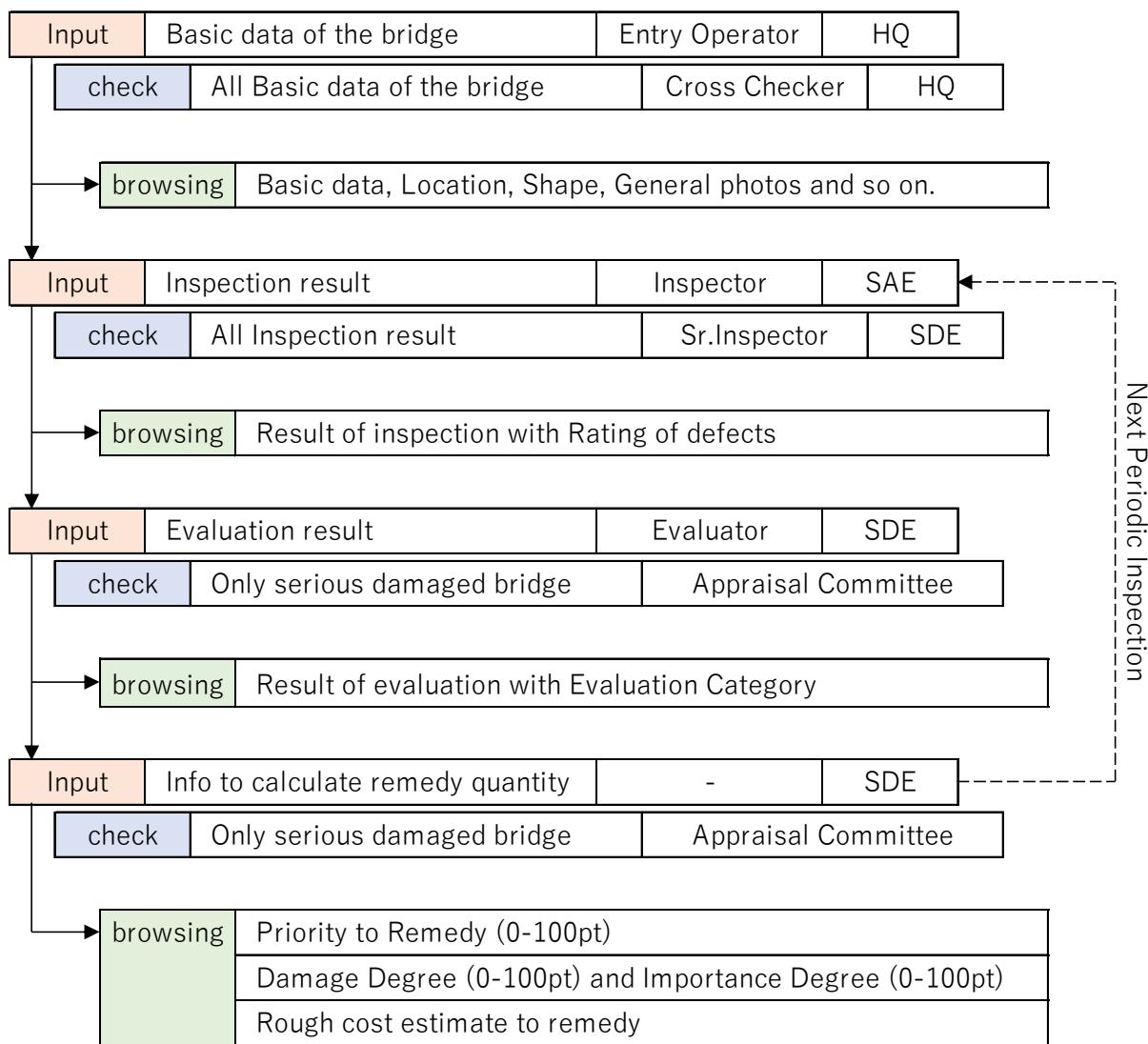
6. HOW TO USE BMS FOR EACH STEP (PERIODIC)

This chapter shows “How to use BMS in Periodic inspection” focused on each step of BMS management.

6.1 Flowchart of BMS in Periodic inspection

Following flowchart shows step of BMS management

After 4 input steps, BMS starts to calculate priority score and rough cost estimate to consider remedy plan for the bridge.

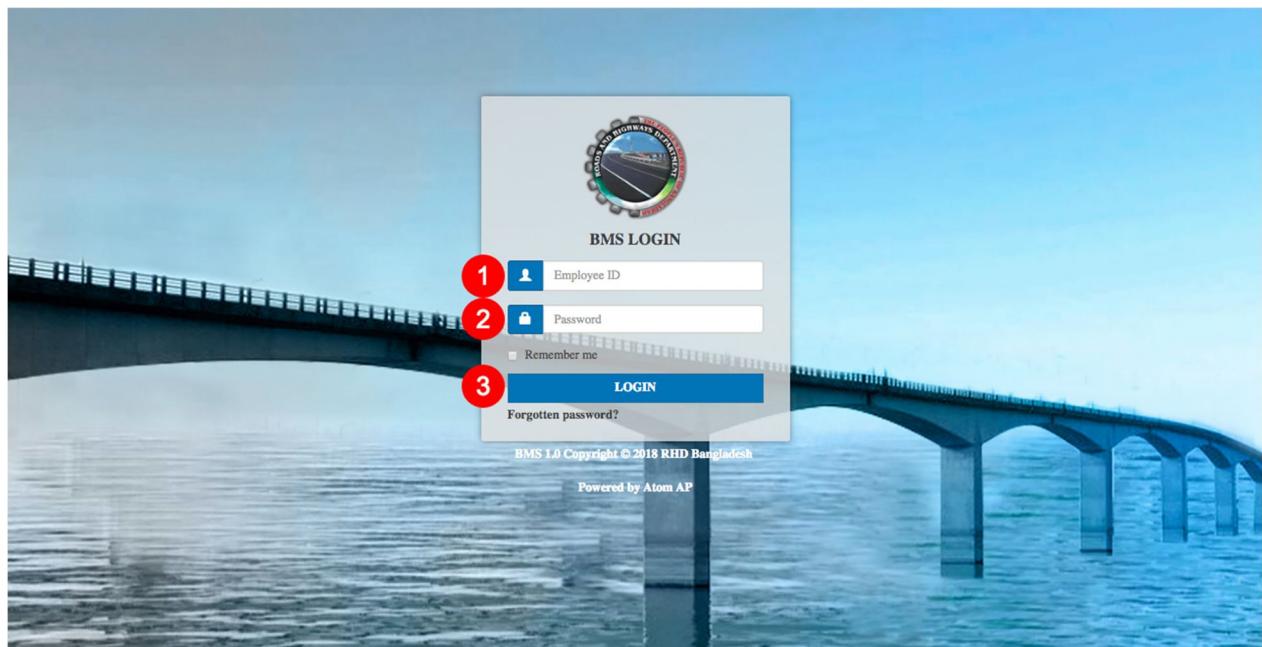


HQ : System section in Head Quarter

SAE : Sub Assistant Engineer

SDE : Sub Divisional Engineer

6.2 Login



Every user needs to login into BMS to access his functions. To login into BMS -

1. Enter valid **Employee ID**
2. Enter **Password**
3. Click **Login**. Successful login will take to next screen. An error message will show for invalid ID or Password.

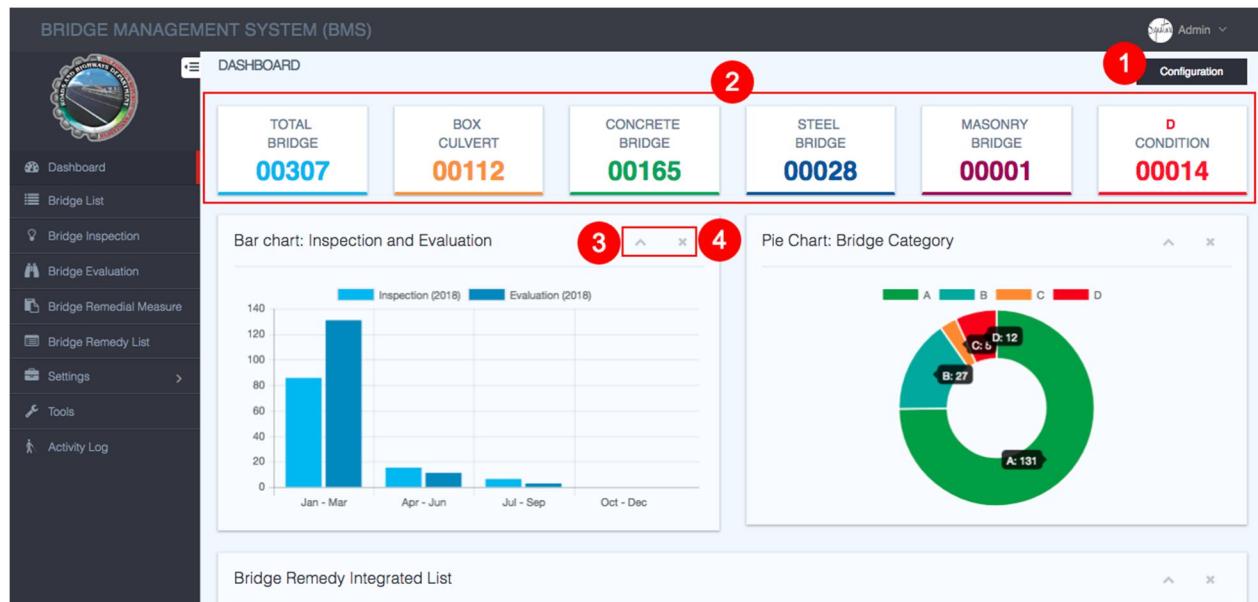
Remember Me: Click on this checkbox to remember the login information into browser.

Forgotten Password: To retrieve password click on this link. It will open another page. Input “Employee ID” and “Email” and click “Send”. A new password will be sent to the inputted email address.

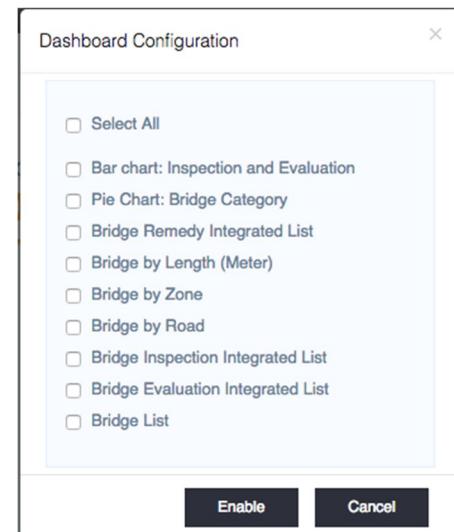
Two side-by-side screenshots. The left one is the 'BMS LOGIN' screen with fields for Employee ID and Password, a 'Remember me' checkbox, and a 'LOGIN' button. The right one is the 'PASSWORD CHANGE REQUEST' screen with fields for Employee ID and Email, a 'SEND' button, and a 'Log in' link at the bottom.

6.3 Dashboard

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public



Dashboard is a common place where user can see the summary of Bridge Basic Data, Inspections Results, Evaluation Results, Bridge Remedy Integrated List.



1. **Configuration:** Dashboard is configurable. To close any section click on the x button from the top-right corner of the section. To enable the section click on **Configuration**. A pop-up window will appear. Select the corresponding section and click "Enable".
2. This section shows an overview of the data available in BMS.
3. To minimize the section click on this ^ button. To maximize the section views again click on this button.
4. To close any section click on this x button. To re-enable that section follow the steps in number 1 (Configuration).

6.4 Input and Browsing of Basic Data

6.4.1. Outline of “Bridge List” page

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

1. Click “Bridge List” to view bridge list page.
2. Click “Add New” to add new bridge data into BMS.
3. Click “Draft” tab to view all bridge data saved as draft.
4. Click “Need Cross Checking” tab to view all bridge data for cross checking.
5. Click “Final” tab to view all bridge inventory data.
6. Click “Configure” to add/remove columns in bridge list table.
7. Click “Filter” link to filter bridge name, type, sub-division etc.
8. Click “Export” button to download bridge list in excel format.
9. User can change number of rows to show in bridge list table. Example: 10, 25, 50, 100.
10. User can search bridge by any values of bridge data.
11. Bridge list view actions:
 - o **Checkbox:** Click this checkbox to select/unselect any bridge.
 - o **Eye Icon:** Click this icon to view bridge data.
 - o **Edit Icon:** Click this icon to open bridge data in edit mode.
 - o **Recycle Bin Icon:** Click this to delete a single bridge data.
 - o **Location Icon:** Click this icon to see the bridge location in google map.
 - o **File Icon:** Click this icon to view bridge inventory data.
12. Scroll to view all bridge data.
13. Click “Next” to see next page. Click “Previous” to see previous page.

6.4.2. Preparation to input Basic Data

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Data Entry Operator and Data Cross Checker prepare following items to input data.

- Paper of Bridge inventory sheet
- Document of BMW's order to add/edit/delete bridge basic information

6.4.3. Step-by-step instruction for Data Entry Operator

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

If you are carrying out to input data **before 1st Periodic Inspection** of the bridge, you can refer **“APPENDIX BMS BASIC DATA TEMPORARY INPUT MANUAL”** at the end of this manual.

Case of adding new bridge into BMS

- (1) Click “Bridge List”
- (2) Click “+Add New”
- (3) Input Bridge Basic Data

The screenshot shows the BMS interface with the following details:

- Header:** BRIDGE MANAGEMENT SYSTEM (BMS) with a user profile icon and 'Mr. Data Entry Operator'.
- Sidebar:** Includes 'Dashboard' and 'Bridge List' (highlighted with a red box labeled '1').
- Main Content:**
 - Header:** BRIDGE LIST, Back, Dashboard, Bridges.
 - Buttons:** Final, Need Cross Checking (2), Draft (21).
 - Actions:** Export, + Add New (highlighted with a red box labeled '2').
 - Search:** Search: dhaka.
 - Table Headers:** SI, Action, Map, Basic Data, Bridge Name, Bridge Type, Road No, Zone, Circle, Division, Sub Division, Span Length.
 - Table Data:**

SI	Action	Map	Basic Data	Bridge Name	Bridge Type	Road No	Zone	Circle	Division	Sub Division	Span Length
1	Eye icon	Location icon	Document icon	Amtola Bailey Bridge	Potable Steel Bridge	R315	Dhaka	Dhaka	Manikganj	Nayarhat	1
2	Eye icon	Location icon	Document icon	Amtola Bridge	Masonry Arch Bridge	R315	Dhaka	Dhaka	Manikganj	Nayarhat	1
3	Eye icon	Location icon	Document icon	Arongobad Culvert-1	Box Culvert	R504	Dhaka	Dhaka	Manikganj	Manikganj	10
4	Eye icon	Location icon	Document icon	Arongobad Culvert-2	Box Culvert	R504	Dhaka	Dhaka	Manikganj	Manikganj	5.63

Note

- You have to input all information with “*”. Inputting information with “*” is mandatory.
- If you don't have mandatory information before first site inspection, you can follow [Temporary Input] rule in order to input temporary information. After first site inspection, you have to update the temporary information to actual information.

< Bridge Data tab >

The screenshot shows a form titled 'Bridge Data tab' with several sections:

- Basic Info:** Includes fields for Bridge No., Bridge Name, Completion Year, Reconstructed Year, Design Standard, Load Restriction, Crossing Under Bridge, and Bridge Owner.
- Description:** A rich text editor with a toolbar for bold, italic, underline, etc.
- Buttons:** Save, Reset, and Back.

1. Bridge NO.*

Bridge NO. is made with GPS(Coordinate) based on following basically.

- GPS Latitude : 12 degree 34 minute 56 second
- GPS Longitude : 98 degree 76 minute 54 second
- Bridge NO. : **123456987654** (12 letters)
- If the bridge is “parallel bridge (two bridges are built side by side)”, because GPS of the bridges are same, 13th letter is required in order to distinguish the bridges. Most popular case of parallel bridge is “upper scream side” and “down scream side”. If the bridge locates upper scream side, add “1” as 13th letter. If down scream side, “2”.

2. Bridge Name*

Bridge Name should be inputted following rule.

- First letter of each word is *Capital letter*. You can't use Capital letter except them.
- If it's necessary to input number after bridge name, you can't insert space between bridge name and “-”. Ex. Test River Bridge-1

3. Bridge Type*

Choose a type of the bridge.

Note

If you refer data of BMMS (old system),

- “RCC Girder Bridge” should be inputted as “RC Girder Bridge”.
- “Steel Beam & RCC Slab” should be inputted as “Steel Girder Bridge”.
- “Bailey Bridge” should be inputted as “Portable Steel Bridge”.
- “Slab Culvert” should be inputted as “Box Culvert”.

4. Completion Year

Input year to complete building the bridge.

5. Reconstruction Year

If the bridge was rebuilt, input year to complete rebuilding the bridge.

If the bridge has not rebuilt, this cell should be blank.

If you don't have the information, this cell should be blank.

6. Design Standard

If you have information of Design Standard to design the bridge, choose it.

7. Design Load

Design Load is maximum load of vehicles in design the bridge.

If you don't have the information, this cell should be blank.

8. Load Restriction (ton)

Load Restriction is set to control heavy vehicles because of damage of the bridge.

If you don't have the information or no restriction, this cell should be blank.

9. Crossing & Public Utility

After choosing crossing condition under the bridge from pull-down menu, new cell to input information of the crossing condition is created automatically. Input the information.

If the bridge has public utility like as gas, water or electricity, input it by same operation. You can input multiple items. If you don't have the information, this cell should be blank.

9. Crossing & Public Utility
Water pipe
If you don't know, no need to choose
Information Of River :
Meghna River
Information Of Water pipe :
a water pipe (owner is unknown) is attached under girder

10. Crossing under Bridge*

Choose nearest condition of under the bridge from pull-down menu.

11. Bridge Owner

Input owner name like as RHD office name.

If you don't have the information, this cell should be blank.

12. Description

Input explanation of the bridge, if it is necessary.

Public View

Public user can look information in this tab, if you click on this check box.

Click on the check box*.

* Check boxes for Public View are set for all tabs in Bridge Info. Click on all check boxes.

< Shape tab >

Basic Info	Shape	Road	Location	Element	Pictures
1. Bridge Length (m)* If you don't know, input as 999.000 (modify after inspection) Input to three decimal places (e.g. 12.000)	2. Bridge Width (m)* If you don't know, input as 999.000 (modify after inspection) Input to three decimal places (e.g. 12.000)				
3. Bridge Effective Width (m)* If you don't know, input as 999.000 (modify after inspection) Input to three decimal places (e.g. 12.000)	4. No. of Span* If you don't know, refer Temporary input rule in manual				
5. Input Span Length Input span length for each span. This cell shows total length after input.	6. Span Arrangement Span Arrangement generates from Input Span Length				
7. No. of Column If you don't know, keep blank (input after inspection)	8. Column Width (m) If you don't know, keep blank Input to one decimal place (e.g. 12.0)				
9. Height of Abutment (m) If you don't know, keep blank	10. Skew Angle Degree If you don't know, keep blank (input after inspection) No need to input after the decimal point (e.g. 90)				
11. Median (m) If you don't know, keep blank (input after inspection)	12. Wheel Guard -L (m) If you don't know, keep blank (input after inspection) Input to three decimal places (e.g. 12.000)				
13. Wheel Guard -R (m) If you don't know, keep blank (input after inspection)	14. Carriage way-L (m) If you don't know, keep blank (input after inspection) Input to three decimal places (e.g. 12.000)				
15. Carriage way-R (m) If you don't know, keep blank (input after inspection) Give value for Median first, then this field will be enabled	16. Lanes On Structure If you don't know, keep blank (input after inspection)				
17. No. of Sidewalk If you don't know, keep blank (input after inspection)	18. Sidewalk-L (m) If you don't know, keep blank (input after inspection) Input to three decimal places (e.g. 12.000)				
19. Sidewalk-R (m) If you don't know, keep blank (input after inspection)	20. No. of Main Girder of Girder Bridge No. of Main Girder for Girder Bridge comes from Bridge Element				
21. Interval of Main Girders (m) If you can't get this length, refer Temporary input rule Input to three decimal places (e.g. 12.000)	22. Height of Main Girder (m) If you can't get this length, refer Temporary input rule Input to three decimal places (e.g. 12.000)				
23. Width of Main Girder (m) If you can't get this length, refer Temporary input rule Input to three decimal places (e.g. 12.000)	24. No. of Lines of Cross Beam No. of Lines of Cross Beam for Girder Bridge comes from Bridge Element				
25. No. of Stringer If you don't know, keep blank (input after inspection)	26. No. of Hinge No. of Hinge for Girder Bridge comes from Bridge Element				
27. No. of Bearings per each line If you don't know, refer Temporary input rule in manual	28. No. of lines of Lateral Bracing If you don't know, keep blank (input after inspection)				
<input type="checkbox"/> Public View					
<input type="button" value="Save"/> <input type="button" value="Reset"/>					

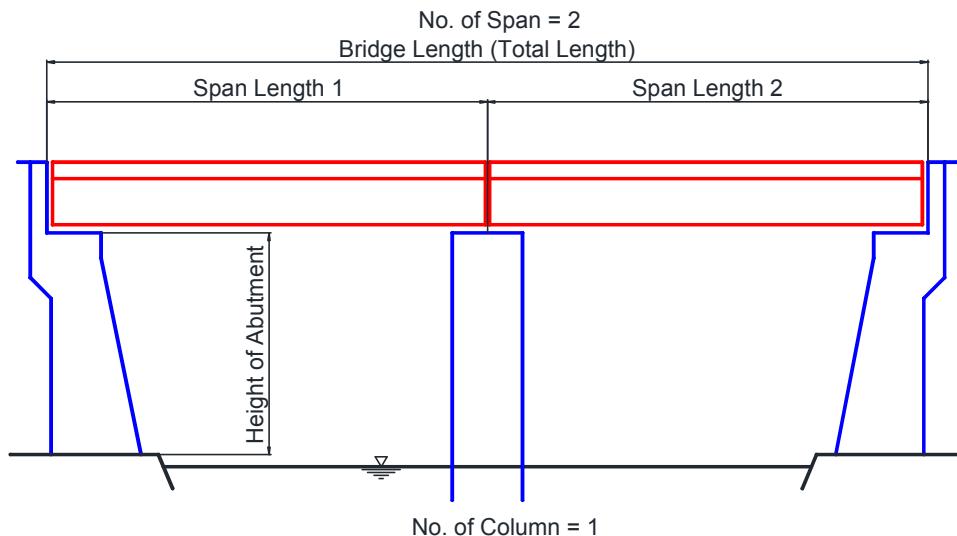
Note

- Each length should be inputted by three decimal places. (e.g. 0.500, 3.125, 30.000)
- When you choose “Box Culvert” in Bridge Data tab, inputting cells in Shape tab are set for culvert automatically.

1. Bridge Length*, 4. No. of Span*,

5. Input Span Length and 6. Span Arrangement

Input length of the bridge. If No. of Span is 1, Span length is same as Bridge Length. After inputting “4. No. of Span”, you can input span lengths in “5. Input Span Length” as same number as No. of Span.



7. No. of Column, 8. Column Width and 9. Height of Abutment

Input shape of substructure.

If you don't have the information, those cells should be blank.

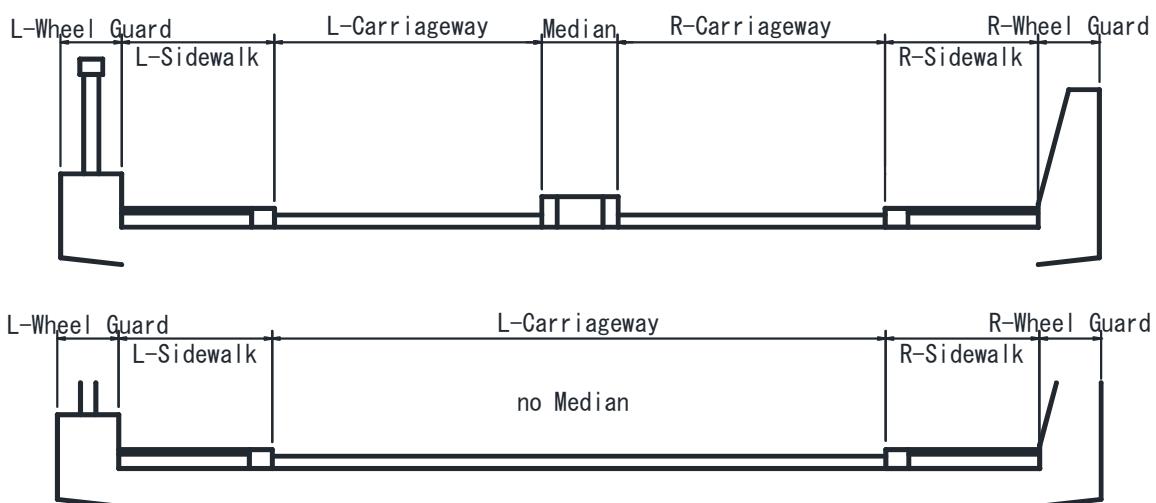
2. Bridge Width*, 3. Bridge Effective Width*,

11. Median, 12(13). L(R)-Wheel guard, 14(15). L(R)-Carriage way,

16. Lanes On Structure, 17. No. of Sidewalk and 18(19). L(R)-Sidewalk

Input width of the bridge referring follow a figure.

If the bridge doesn't have Median, it's not necessary to input R-Carriage way.



- 21. Interval of Main Girders (except Culvert Bridge),
- 22. Height of Main Girder (except Culvert Bridge) and
- 23. Width of Main Girder (except Culvert Bridge)

Input shape of Main Girder.

Each item shows different length by bridge type. Refer following figures.

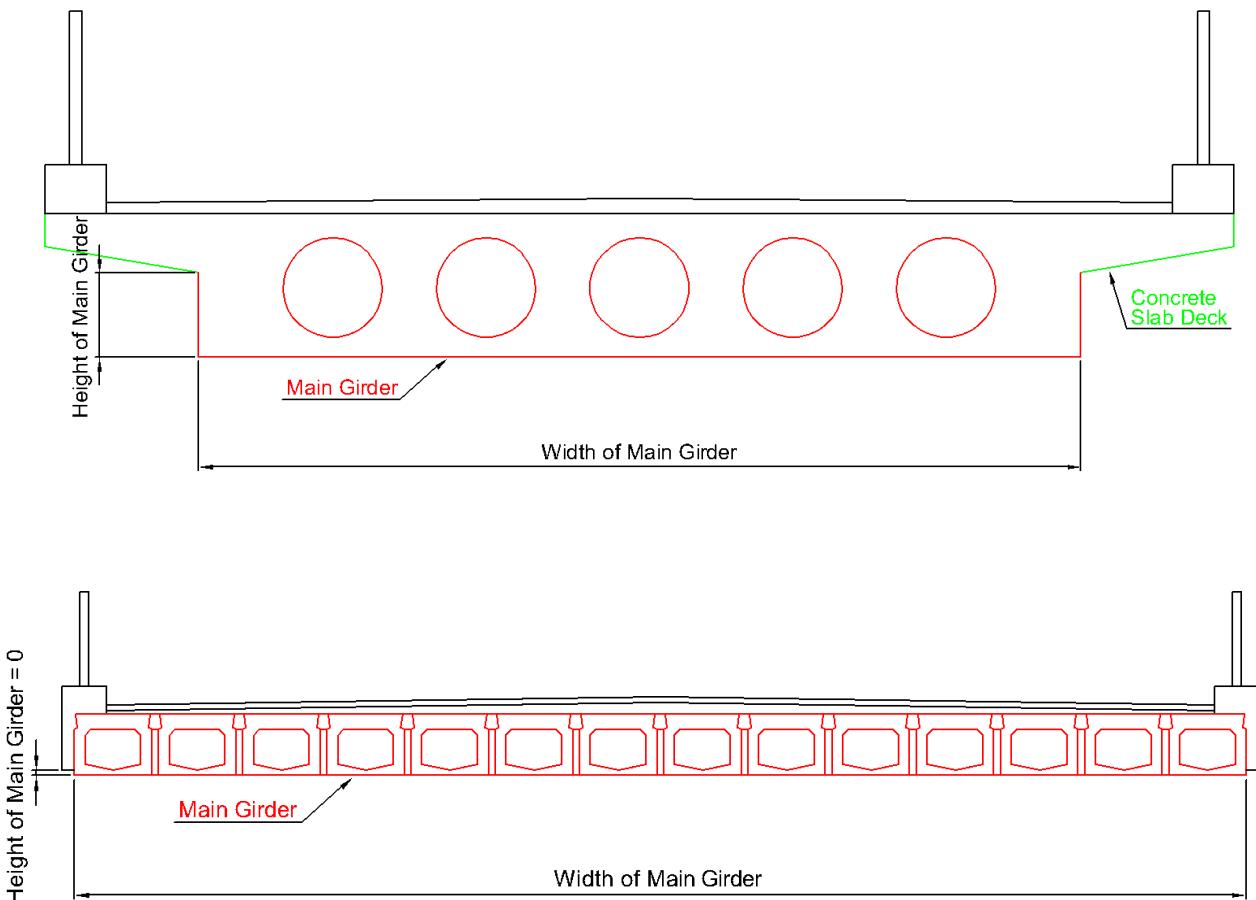
[Temporary Input after 1st Periodic Inspection of the bridge]

It may be impossible to measure some length, because of inspector can't approach it.

In that case, the length should be guessed based on photos.

If you can't get the length yet, input temporary figure as following.

[Small Slab Bridge / RC Slab Bridge]



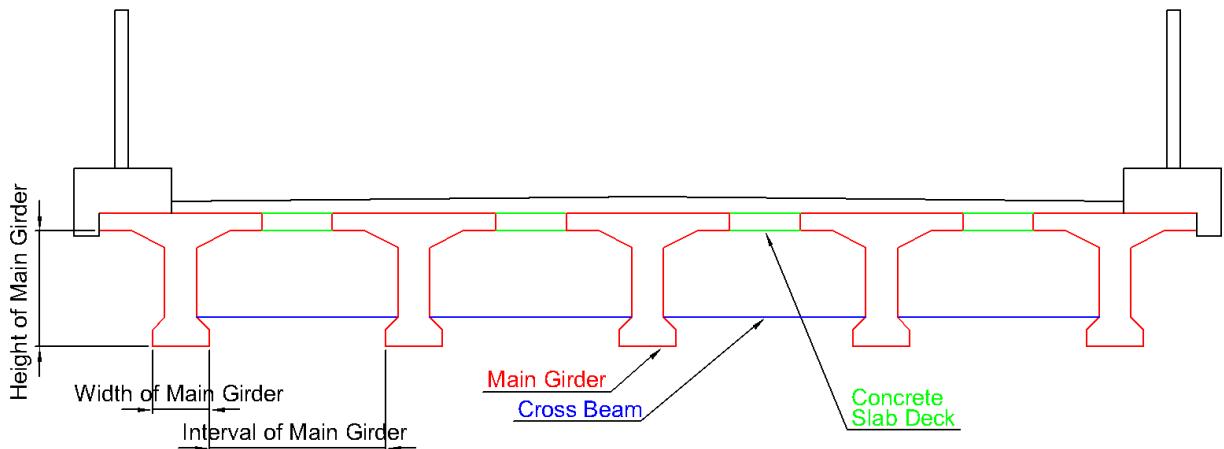
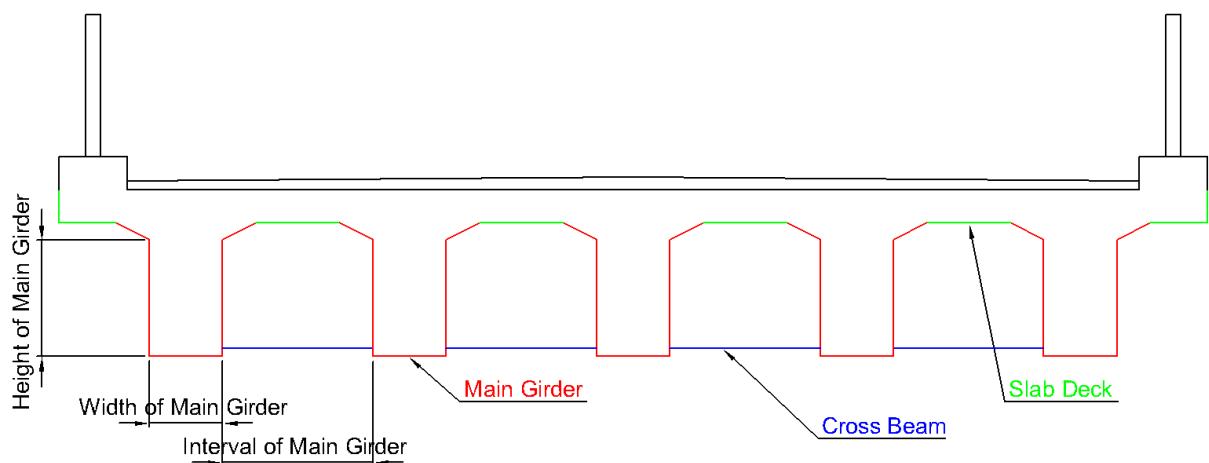
- Interval of Main Girder : input always “0”.
- Height of Main Girder : Temporary = “0”
- Width of Main Girder : Temporary = “Effective Width”

e.g. Temporary input case

If Effective width = 7.500m,

- Interval of Main Girder = 0.000m : always
- Height of Main Girder = 0.000m : temporary
- Width of Main Girder = 7.500m : temporary

[RC Girder Bridge / PC Girder Bridge]



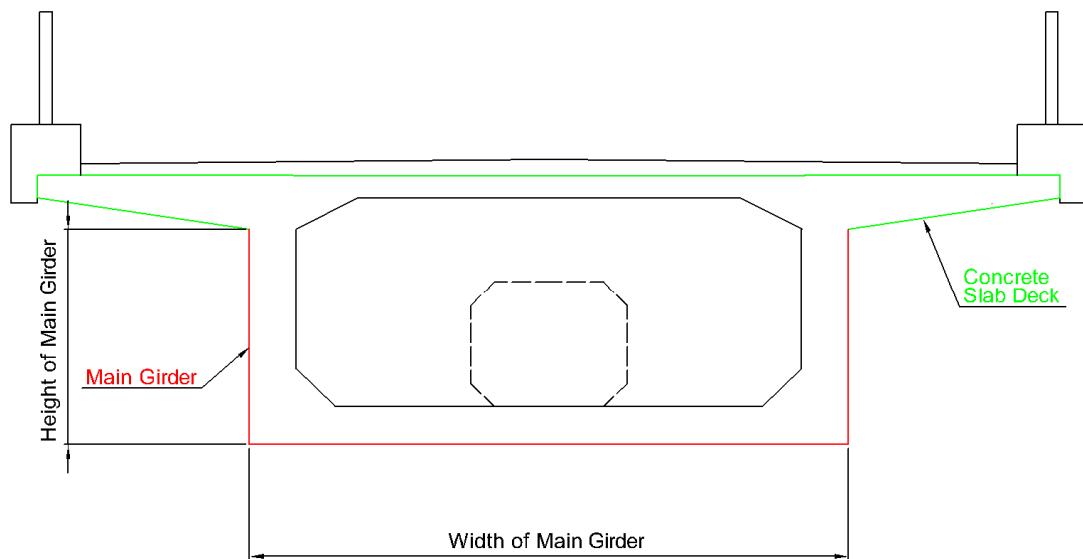
- Interval of Main Girder : Temporary = "Effective Width" / ("NO. of Main Girder" - 1)
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : Temporary = 0.300 m

e.g. *Temporary input case*

If Span length = 30.000m, Effective width = 10.000m and Number of Main Girder = 5,

- Interval of Main Girder = $10.000\text{m} / (5-1) = 2.500\text{m}$: temporary
- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 0.300m : temporary

[RC Box Girder Bridge / PC Box Girder Bridge]



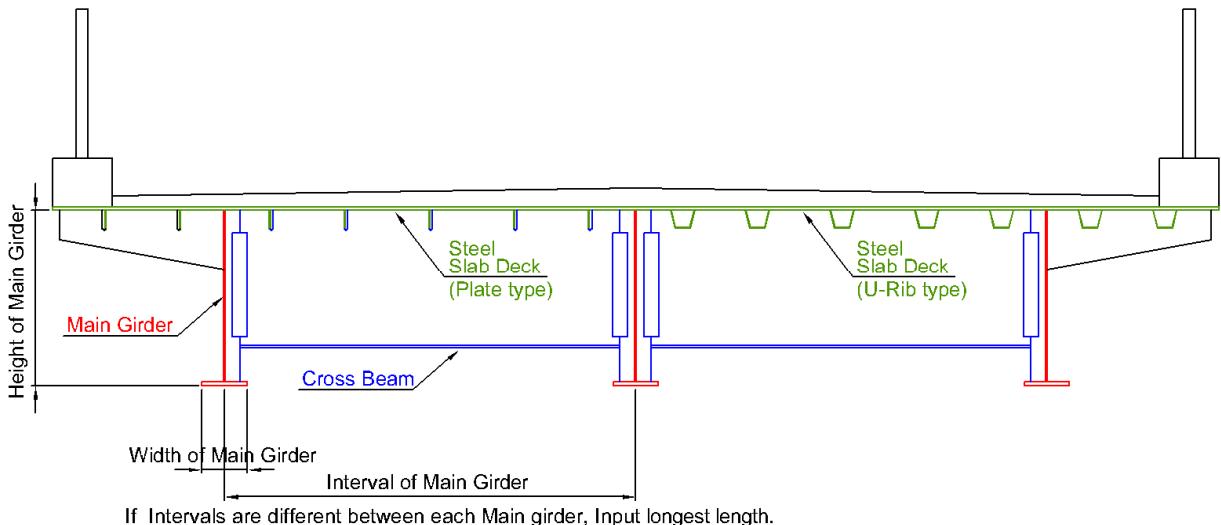
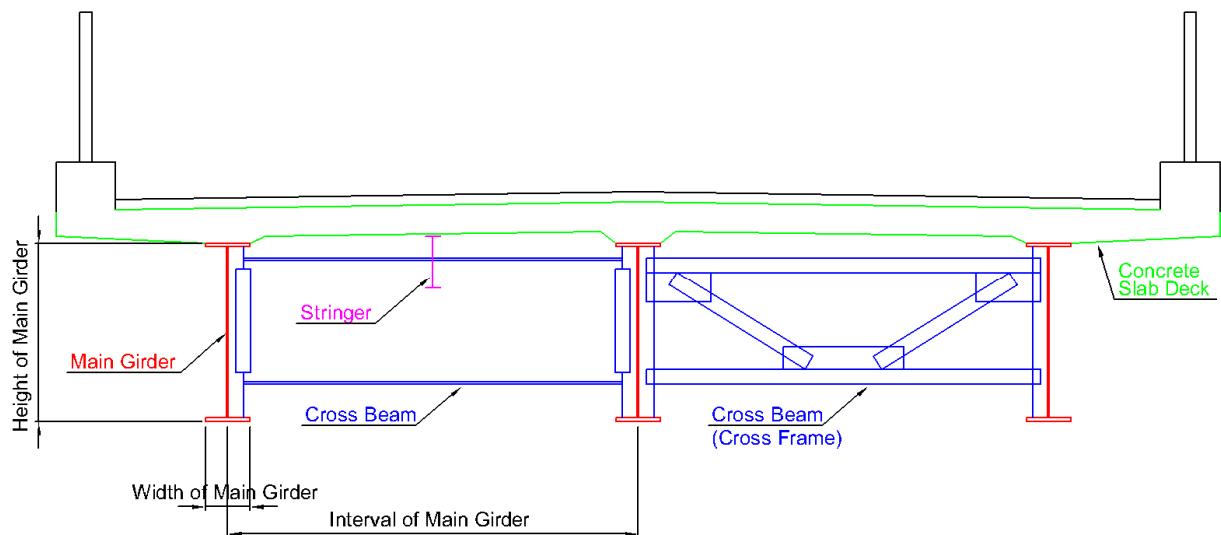
- Interval of Main Girder : input always “0”
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : “Effective Width”

e.g. *Temporary input case*

If Span length = 30.000m and Effective width = 10.000m,

- Interval of Main Girder = 0.500m : always
- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 10.000m : temporary

[Steel Girder Bridge]



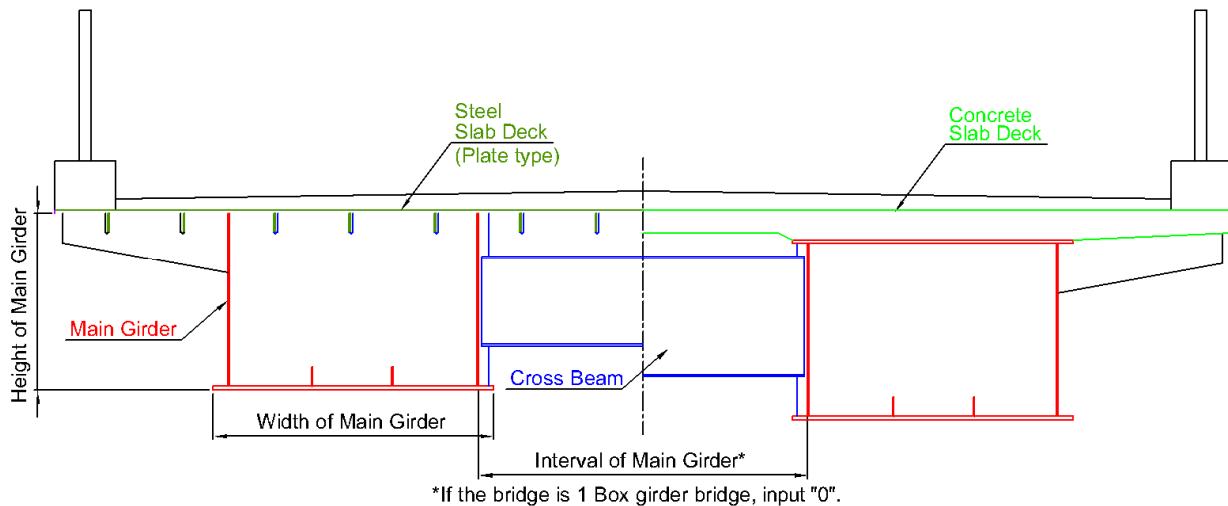
- Interval of Main Girder : Temporary = "Effective Width" / "NO. of Main Girder"
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : Temporary = "Height of Main Girder" / 5

e.g. Temporary input case

If Span length = 30.000m, Effective width = 7.500m and Number of Main Girder = 3,

- Interval of Main Girder = $7.500\text{m} / 3 = 2.500\text{m}$: temporary
- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = $2.000\text{m} / 5 = 0.400\text{m}$: temporary

[Steel Box Girder Bridge]



(Multiple box girders bridge)

- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = 2.500m
- Interval of Main Girder : Temporary =

$$\text{“Effective Width”} - \text{“Width of Main Girder”} \times \text{“NO. of Main Girder”}$$

e.g. Temporary input case (Multiple main girder)

If Span length = 30.000m, Effective width = 10.000m and Number of Main Girder = 2,

- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 2.500m : temporary
- Interval of Main Girder = $10.000\text{m} - 2.500\text{m} \times 2 = 5.000\text{m}$: temporary

(Single box girders bridge)

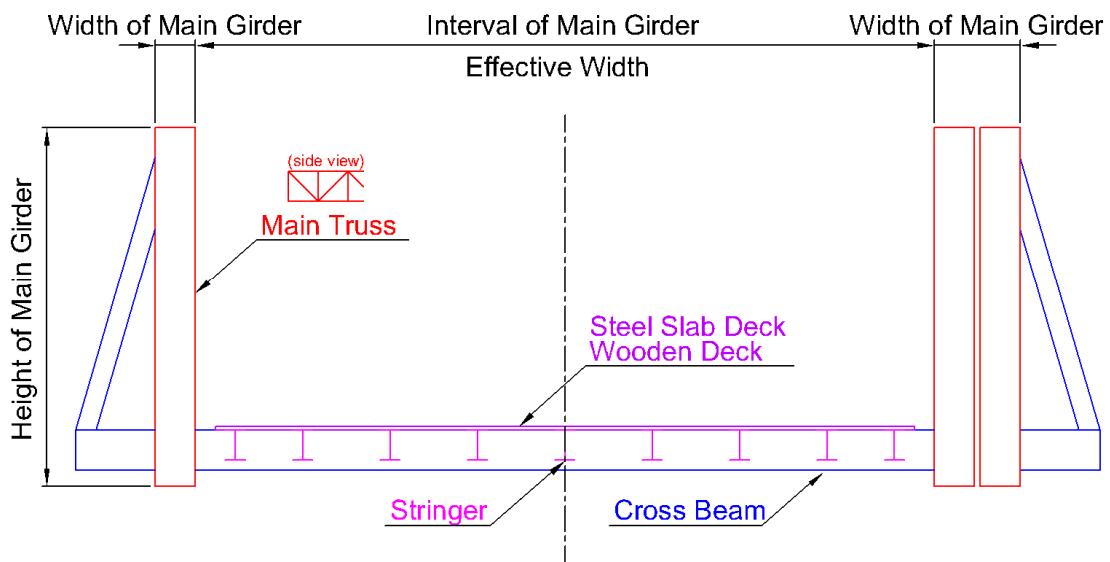
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = “Effective Width”
- Interval of Main Girder : input always “0”

e.g. Temporary input case (Multiple main girder)

If Span length = 30.000m, Effective width = 7.500m and Number of Main Girder = 1,

- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 7.500m : temporary
- Interval of Main Girder = 0.000m : temporary

[Truss Bridge / Portable Steel Bridge]

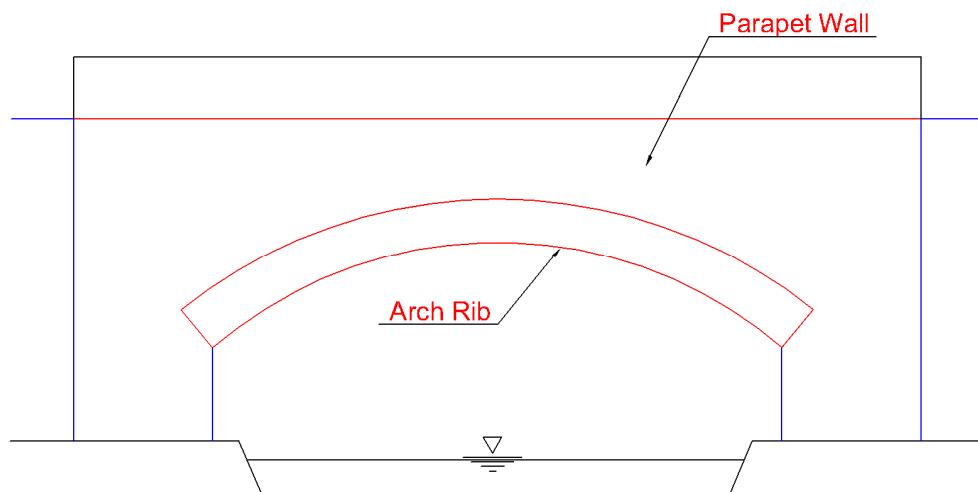


- Interval of Main Girder : always same as "Effective Width".
- Height of Main Girder : Temporary = 2.000 m
- Width of Main Girder : Temporary = 0.200 m

[Masonry Arch Bridge]

It is not necessary to input girder length of Masonry Arch Bridge because of following reason.

- The shape is markedly different from other bridge types. It is impossible to apply above inputting rules.
- Remedial measures in Bridge Rehabilitation/Strengthening Manual is not applied to Masonry Arch Bridge, because only this bridge is made with masonry. Therefore, this bridge type is not targeted to calculate rough cost estimate to remedy. It means length information to calculate is not required from BMS.



[Mixed Types Bridge]

This bridge type is not shown in Inspection & Evaluation Manual. Mixed Types Bridge is always multiple span bridge and defined as following,

- The bridge consists of multiple types of bridge.

e.g.

1st span : **RC Girder Bridge**, 2nd span : **PC Box girder Bridge**, 3rd span : **RC Girder Bridge**

- The bridge consists of multiple materials.

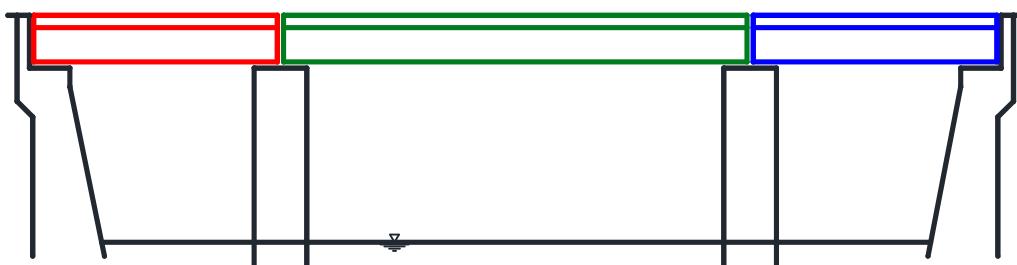
e.g.

1st span : **RC Girder Bridge**, 2nd span : **Steel Girder Bridge**, 3rd span : **RC Girder Bridge**

- The bridge consists of multiple types and materials.

e.g.

1st span : **RC Girder Bridge**, 2nd span : **Steel Box Girder Bridge**, 3rd span : **RC Slab Bridge**



Because only a type of bridge is enabled into BMS, this type is required to manage BMS.

Note

- Number of Main Girder, cross beam and so on of Basic Data should be inputted as maximum number of main girder in all spans.

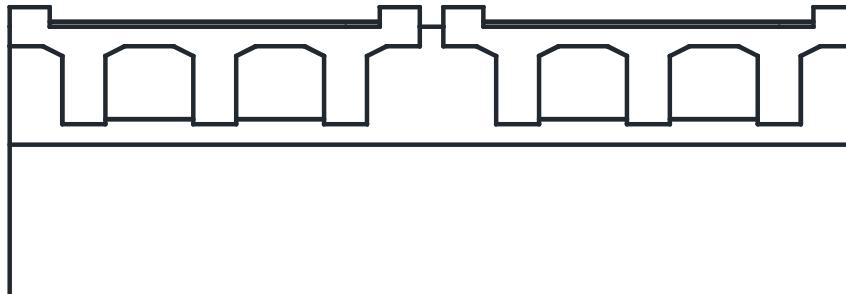
- Inspection sheet and Evaluation sheet of Mixed Types Bridge consist of “All types of defects” (both of types of defects of “Concrete” or “Steel (rubber)”).

Cells of inspection sheet not required (e.g. concrete defect of steel element) should be inputted as “-“.

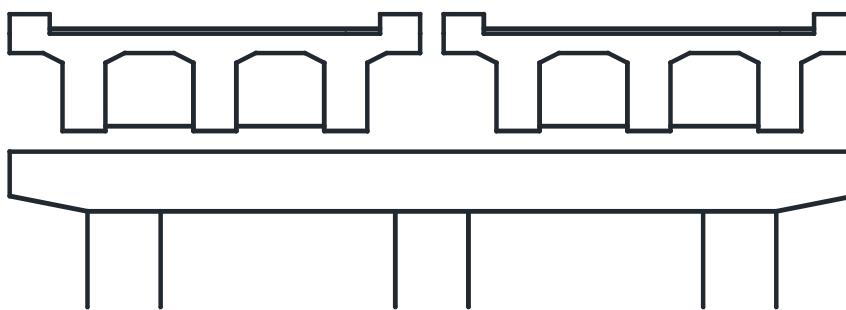
Cells of evaluation sheet not required (e.g. concrete defect of steel element) should be inputted as “N“.

[How to input Parallel bridge sharing one substructure]

In the case of “Parallel bridge (two bridges being built side by side.)”, one substructure supports both of two superstructures like as following drawings.



e.g. One Abutment with parallel bridges



e.g. One Pier with parallel bridges

How to input the parallel bridges is shown as following.

- Parallel bridges should be registered as **TWO bridges**. (separated bridges)
- Bridge No. is inputted as following,
 - Bridge locating upstream side : 12 letters (by GPS) + **1 (13th letter)**
 - Bridge locating downstream side : 12 letters (by GPS) + **2 (13th letter)**
- Each substructure should be inspected as **ONE component**. However, BMS requires result of superstructure and substructure. Therefore, inputting result should be carried out as following,
 - Bridge locating upstream side
 - : Result of the superstructure of upstream side + **Result of the substructure***
 - Bridge locating downstream side
 - : Result of the superstructure of downstream side + **Result of the substructure***

* Result of the substructure is **same result**.

21. Width of Culver (*Box Culvert*)

22. Height of Side Wall (*Box Culvert*)

Input shape of Culvert.

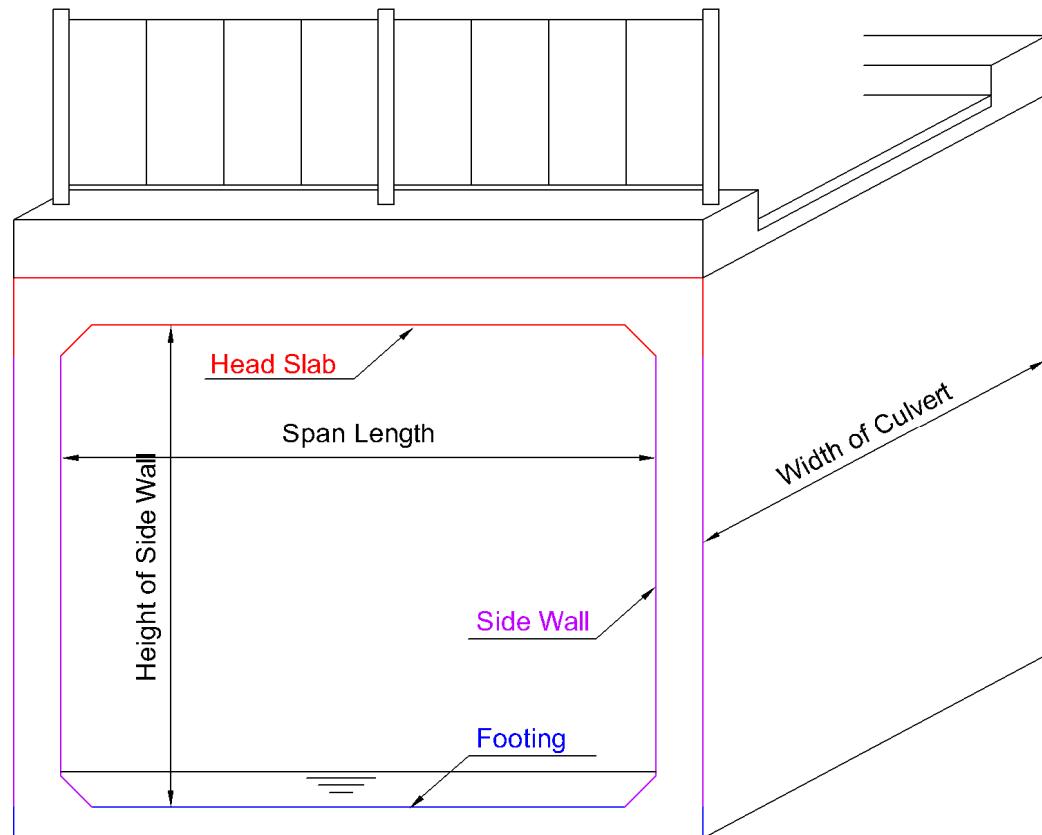
[Temporary Input after 1st Periodic Inspection of the bridge]

It may be impossible to measure some length, because of inspector can't approach it.

In that case, the length should be guessed based on photos.

If you can't get the length yet, input temporary figure as following.

[Box Culvert]



- Width of Culver : Same as "Bridge Width".
- Height of Side Wall : Temporary = 2.000 m

e.g. *Temporary input case*

If Bridge width = 7.500m,

- Width of Culver = 7.500m : temporary
- Height of Side Wall = 2.000m : temporary

10. Skew Angle Degree

Input angle of “parapet wall” and “direction of traffic”.

Skew angle of bridges are mainly 90° (straight bridge).

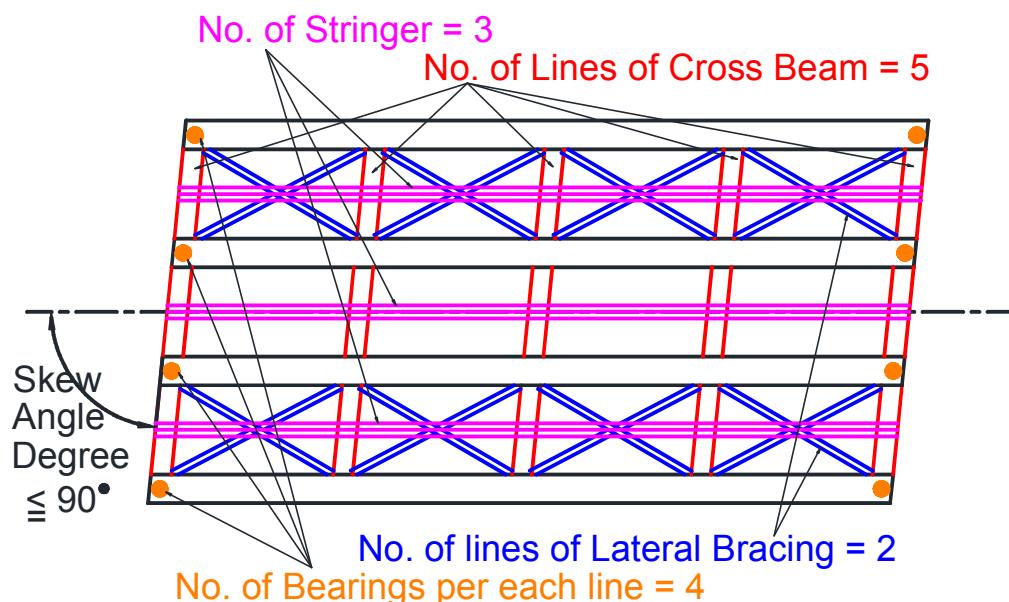
24. No. of Lines of Cross Beam (except Box Culvert)

25. No. of Lines of Stringer (Steel Girder Bridge)

27. No. of Bearings per each line (except Box Culvert)

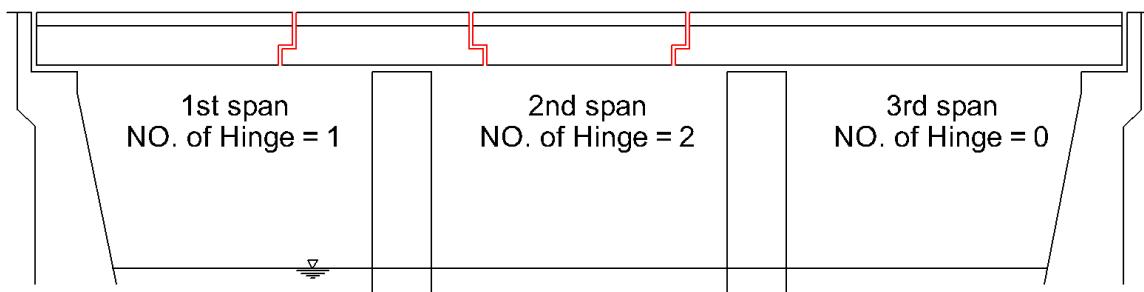
28. No. of Lines of Lateral Bracing (Steel Girder Bridge)

Input number of each lines if the element exists.



26. NO. of Hinge

Input number of the Gerber hinge for each span.



<Road tab>

Basic Info	Shape	Road	Location	Element	Pictures
1. Road Class* -- Select --		2. Road No* -- Select --			
3. Road Name If you don't know, keep blank		4. LRP Name If you don't know, keep blank Input three figures and one alphabet (e.g. 001a)			
5. New LRP Name If you don't know, keep blank Follow rule of new LRP Name		6. Offset of LRP If you don't know, keep blank No need to input after the decimal point (e.g. 255)			
7. Chainage (km) If you don't know, keep blank Input to three decimal places (e.g. 12.000)		8. Number of Lanes Input same number as Lanes On Structure			
9. Approach Road Width If you don't know, keep blank Input to three decimal places (e.g. 12.000)		10. Detour/Alternate Route* -- Select -- If you don't know, input as "None" (modify after inspection)			
11. Traffic Volume* -- Select -- Refer RMMS database		12. Heavy Vehicle Traffic Rate If you don't know, keep blank			
13. Census (Year) If you don't know, keep blank Refer RMMS database					
<input type="checkbox"/> Public View					
<input type="button" value="Save"/> <input type="button" value="Reset"/>					

1. Road Class*, 2. Road No.* and 3. Road Name

Input information of the road.

4. LRP Name

Input LRP Name if you can get it from current BMMS.

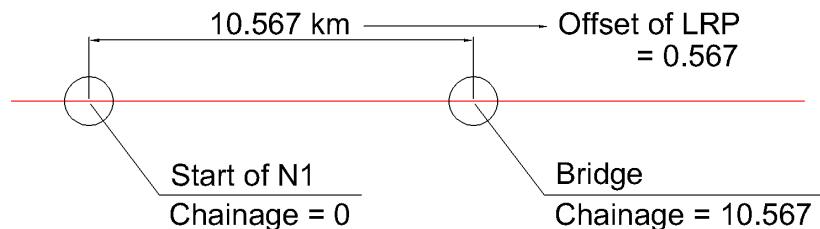
5. New LRP Name

Input New LRP Name of the bridge after putting a new rule of LRP Name.

6. Offset of LRP and 7. Chainage

Chainage is distance between start of the road and bridge location.

Offset of LRP is figure shown as down to the decimal point of Chainage.



8. Number of Lanes

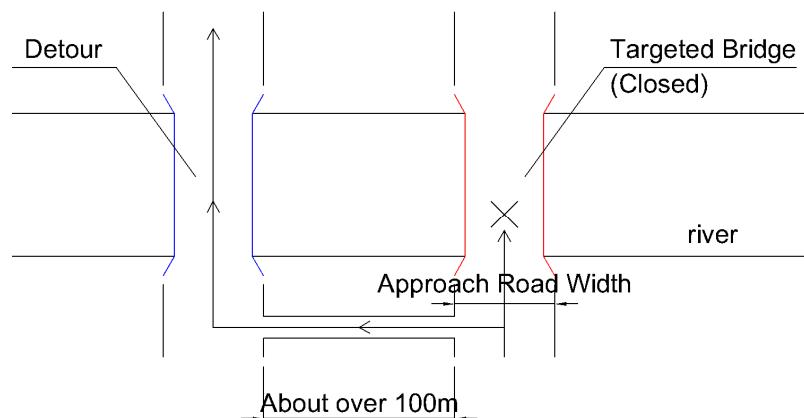
Input number of traffic lanes on the bridge. (same as “16. Lanes On Structure” in Shape)

9. Approach Road Width

Input width of approach road of the bridge.

10. Detour/Alternate Route*

If there is another road near the bridge to be able to use as substitute the bridge, choose “exist”.



Ex.

When targeted bridge is closed, user can use another bridge as Detour.

In this case, importance degree will be set as lower.

11. Traffic Volume*, 12. Heavy Vehicle Traffic Rate and 13. Census

Choose range of Traffic Volume of the bridge.

This volume shows AADT (Annual Average Daily Traffic).

Note

You can refer RMMS (Road Maintenance & Management System) of RHD.

1. Access to <http://www.rhd.gov.bd/RoadDatabase/> and search targeted Road No.
2. Click “Show details” at Traffic (AADT).

Basic Info			
Road No.	N503	Starts at	Utholi
Road Name	Utholi-Aricha Road	Ends at	Aricha
Class	National Highway		
Length	3.269 Km		
Traffic & Other Info			
Traffic (AADT)	7679 (Motorized: 5785 , Non-Motorized: 1894)	Show details	
Average width	7.52 (m)	Width Detail	
No. of bridges	8		
No. of ferry ghatas	0		
Location referencing points - LRP (what is a LRP?)	14	LRP Listing	
Location			

4. Choose link No. nearest to targeted bridge and check most right column, “Traffic(AADT)”
 - Heavy Vehicle Traffic Rate is calculated as
“ {AADT – (total number of truck and bus)} / AADT ” (Micro bus is not including)
 - Census is year of last inspection of traffic volume
Census is survey year of each traffic data. If you don't know, keep blank.

<Location tab>

Basic Info	Shape	Road	Location	Element	Pictures
1. Zone*	-- Select --		2. Circle*	-- Select --	
3. Division*	-- Select --		4. Sub Division*	-- Select --	
5. SAE*	-- Select --		6. District	If you don't know, keep blank	
7. Upazilla	If you don't know, keep blank		8. Union	If you don't know, keep blank	
9. Village	If you don't know, keep blank		10. Country	If you don't know, keep blank	
11. GPS Latitude	Degree <input type="text" value="If you don't know, keep blank (input after)"/>	Minute <input type="text" value="If you don't know, keep blank (input after)"/>	Second <input type="text" value="If you don't know, keep blank (input after)"/>		
12. GPS Longitude	Degree <input type="text" value="If you don't know, keep blank (input after)"/>	Minute <input type="text" value="If you don't know, keep blank (input after)"/>	Second <input type="text" value="If you don't know, keep blank (input after)"/>		
Reference Level	<input type="text" value="Reference Level"/>				
<input type="checkbox"/> Public View					
<input type="button" value="Save"/> <input type="button" value="Reset"/>					

1. Zone*, 2. Circle*, 3. Division* and 4. Sub Division*

Choose division information of the bridge.

5. SAE*

SAE is Section Officer. Choose one from pull-down menu.

6. District, 7. Upazilla, 8. Union, 9. Village and 10. Country

Input location of the bridge.

First letter of each word is Capital letter. You can't use Capital letter except them.

11. GPS Latitude, 12. GPS Longitude

Input GPS information of the bridge.

They should be inputted as “xx Degree xx Minute xx Second”.

Note

GPS information is required to display map and make Bridge No.

Input Reference Level of the bridge. If you don't know, keep blank.

<Element tab>

Basic Info	Shape	Road	Location	Element	Pictures
Superstructure					
<input checked="" type="checkbox"/> Main Girder	-----			3	
<input checked="" type="checkbox"/> Main Girder Hinge	-----			2	
<input checked="" type="checkbox"/> Cross Beam	-----			12	
<input checked="" type="checkbox"/> Deck Slab (Concrete)	RC			4	
<input type="checkbox"/> Stringer	-----				
<input type="checkbox"/> Main Truss	-----				
<input type="checkbox"/> Main Arch	-----				
<input type="checkbox"/> Outer Cable	-----				
<input type="checkbox"/> Main Tower	-----				
<input type="checkbox"/> Head Slab	-----				
<input type="checkbox"/> Lateral Bracing	-----				
<input type="checkbox"/> Deck Slab (PC)	-----				
<input type="checkbox"/> Deck Slab (Steel)	-----				
<input type="checkbox"/> Arch Rib	-----				
<input type="checkbox"/> Parapet Wall	-----				
Select Element Type					
Substructure					
<input checked="" type="checkbox"/> Pier	T-shaped Column Type			1	
<input checked="" type="checkbox"/> Abutment	Gravity Type			2	
<input checked="" type="checkbox"/> Foundation	Unknown			3	
<input type="checkbox"/> Wing Wall	-----				
<input type="checkbox"/> Footing	-----				
<input type="checkbox"/> Side Wall	-----				
Bearings					
<input checked="" type="checkbox"/> Bearing (Rubber)	Rubber			2	
<input checked="" type="checkbox"/> Bearing Seat/Bed	-----			2	
<input type="checkbox"/> Bearing (Steel)	Select Element Type			2	
<input type="checkbox"/> Anchor Bolts	-----				
Deck Surface					
<input checked="" type="checkbox"/> Railing (Steel)	Steel			2	
<input checked="" type="checkbox"/> Pavement	Asphalt			1	
<input checked="" type="checkbox"/> Wheel Guard	-----			2	
<input type="checkbox"/> Railing (Concrete)	Select Element Type				
<input type="checkbox"/> Curb	-----				
Drainage System					
<input checked="" type="checkbox"/> Drainage System	-----			1	
Inspection Facilities					
<input checked="" type="checkbox"/> Inspection Facility	-----			1	
Utilities					
<input checked="" type="checkbox"/> Utility Pipe	-----			1	
Expansion Joint					
<input checked="" type="checkbox"/> Expansion Joint (Steel)	Steel			3	
<input type="checkbox"/> Expansion Joint (Rubber)	Select Element Type			3	
Others					
<input checked="" type="checkbox"/> Bridge Approaches	-----			2	
<input checked="" type="checkbox"/> Retaining Wall	-----			2	
<input checked="" type="checkbox"/> Road Sign	-----			1	
<input checked="" type="checkbox"/> Lighting Facility	-----			1	
<input type="checkbox"/> Public View					
Save Reset					

Information in Element tab is necessary to make Inspection Report Sheet (Blanked) automatically.

- Choose and check boxes of necessary elements and input number of the elements.
- Each bridge type has basic elements to consist the bridge. Click on check box of the elements has checked and fixed automatically.
- You can refer “Temporary Input Manual” in Appendix of this manual.

<Pictures tab>

Basic Info	Shape	Road	Location	Element	Pictures																
<div style="display: flex; justify-content: space-between;"> <div style="flex: 1;"> <p>1. Title*</p> <input type="text" value="Max 25 characters"/> </div> <div style="flex: 1;"> <p>2. Order</p> <input type="text"/> </div> </div> <p>3. Description</p> <input type="text" value="Max 200 characters"/> <p>4. Image*</p> <p><input type="button" value="Choose File"/> No file chosen</p> <div style="border: 1px solid #ccc; padding: 10px; width: 100%;"> <p style="text-align: center;">Image Preview</p> </div>																					
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><input type="checkbox"/> Feature Photo</p> <p>By checking, this photo is displayed with mouseover the bridge name in Bridge List</p> </div> <div style="width: 45%;"> <p><input type="checkbox"/> Public View</p> <p>By checking, this photo is opened to Public User</p> </div> </div>																					
<p><input type="button" value="Save"/> <input type="button" value="Reset"/></p> <hr/>																					
<p><input type="button" value="+ Add New Picture"/></p>																					
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Records per page</p> <input type="text" value="50"/> </div> <div style="width: 20%;"> <p>Search:</p> <input type="text"/> </div> </div>																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">SI</th> <th style="width: 10%;">Action</th> <th style="width: 10%;">Order</th> <th style="width: 10%;">Picture</th> <th style="width: 10%;">Title</th> <th style="width: 10%;">Feature Photo</th> <th style="width: 10%;">Public Access</th> <th style="width: 10%;">Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td>test</td> <td>Yes</td> <td>Yes</td> <td></td> </tr> </tbody> </table>						SI	Action	Order	Picture	Title	Feature Photo	Public Access	Description	1				test	Yes	Yes	
SI	Action	Order	Picture	Title	Feature Photo	Public Access	Description														
1				test	Yes	Yes															
<p>Showing 1 to 1 of 1 entries</p>																					
<p><input type="button" value="Previous"/> 1 <input type="button" value="Next"/></p>																					

Pictures in Bridge Inventory, like as general drawings, photos of general view, side view, under the bridge, location map, and drawing of element numbering system are uploaded from this tab. By clicking “+Add New Picture”, you can start to upload a picture.

1. Title*

Input Title of the picture,

2. Order

Order number is made by BMS automatically when the picture uploaded.

You can arrange order of pictures in Bridge Inventory by setting number.

Picture which has lower order number is displayed upper part of the Inventory sheet.

3. Description

You can attach explanation for the picture.

4. Image*

By clicking the “Select a file”, file browser is opened. Choose the picture and click “OK”.

Uploaded picture is displayed as fixed height with same ratio.

Note

It is better that size of uploaded picture is **lower than 1.0 Mbyte**.

There are no limit size to upload. However, operation of BMS will be slow because of the too large sized picture.

Feature Photo Picture

By clicking on this check box, the photo displays with mouse over the bridge name in Bridge List.

Public View

By clicking on this check box, the photo will be opened to Public Users.

Bridge List					
SI	Action	Map	Basic Data	Bridge Name	Bridge Picture
1	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dummy_01	 036

6.4.4. Step-by-step instruction for Data Cross Checker

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

If there are some bridges to be cross-checked, white figure with red circle is displayed in “Need Cross Checking” tab. The figure shows number of bridges under waiting to be checked.

SI	Action	Map	Basic Data	Bridge Name	Bridge Type	Road No	LRP Name	Zone	Circle	Division	Sub Division	Total Length
1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Test Bridge-12345	Box Culvert							

- (a) Click “Bridge List”
- (b) Click “Need Cross Checking”.
- (c) Check all data inputted comparing with Paper of Bridge inventory sheet.
- (d) Click “Edit” in each tab.
- (e) If you found something to modify, edit it.
- (f) Click “Save as final”.

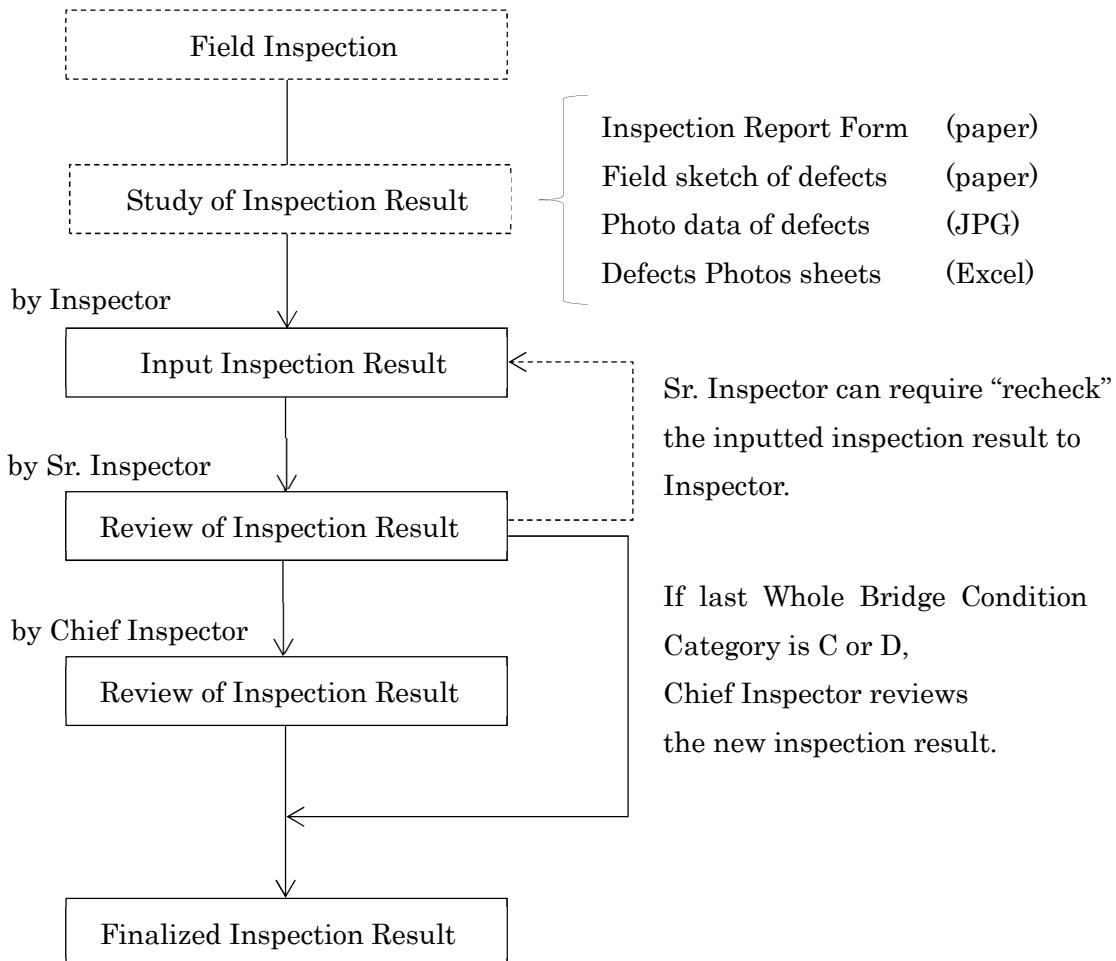
6.5 Input and Browsing of Inspection Result : Bridge Inspection

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Following flowchart shows outline of “input” and “approval” step of Inspection result in BMS.

You can refer “3.7 Bridge Inspector” to understand types of Inspector in the chart.

This section shows explanation of “Periodic Inspection”.



6.5.1. Preparation to input Inspection Result.

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

- Blank Inspection sheet written inspection result (paper)
- Field sketch of defects (paper)
- Photo data of defects (JPG)
- Defects Photos sheets (Excel)

6.5.2. Outline of “Bridge Inspection” page

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

The screenshot displays the BRIDGE MANAGEMENT SYSTEM (BMS) interface, specifically the Bridge Inspection module. The left sidebar contains navigation links such as Dashboard, Bridge List, Bridge Inspection, Bridge Evaluation, Bridge Remedial Measure, Bridge Remedy List, Settings, Tools, and Activity Log. The main content area is titled "BRIDGE INSPECTION LIST". It features two integrated lists: "Periodic Inspection Integrated List" and "Routine Inspection Integrated List". Each list has its own set of filters, search, export, and preparation buttons. Red numbered circles (1-16) highlight specific UI elements across both lists.

Element Number	Element Description
1	Prepare Inspection Sheet button (Periodic)
2	Blank Sheets button
3	Draft button
4	Submitted For Review button
5	For Approval button
6	Unsigned button
7	Final button
8	Export button (Periodic)
9	Prepare Inspection Sheet button (Periodic)
10	Records per page dropdown (Periodic)
11	Search input field (Periodic)
12	Export button (Routine)
13	Prepare Inspection Sheet button (Routine)
14	Action, Result Sheet, Report Form buttons (Periodic)
15	Previous, Next buttons (Routine)
16	Top right corner icon

- Click “Prepare Inspection Sheet”, Select “Periodic” and click create.
- Click “Blank Sheets” to view all blank inspection sheets.
- Click “Draft” to view all draft inspection sheets.
- Click “Submitted for Review” to view all inspection sheets submitted for review.
- Click “For Approval” to view all inspection sheets submitted for approval.
- Click “Unsigned” to view all inspection sheets approved but unsigned.
- Click “Final” to view all inspection sheets approved and signed.
- Click “Filter” to filter inspection list.
- By default most 10 recent inspections data will show. Click to view all inspection sheets.
- User can change number of rows to show in list table. Example: 10, 25, 50, 100.
- User can search bridge by any values of bridge data.
- Click “Export” button to download inspection list in excel format.
- Click “Prepare Inspection Sheet”, Select “Periodic” or “Routine” and click create.
- Inspection list view actions:
 - “Recycle Bin Icon”: Click this icon to delete inspection sheet.
 - “Book Icon”: Click this icon to view inspection results.
 - “File Icon”: Click this icon to see bridge inventory data.
- Click “Next” to see next page. Click “Previous” to see previous page.
- Click this icon to go to top of the page in one click.

6.5.3. Step-by-step instruction for Inspector

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Note

If you find bridge basic data to be modified during field inspection, you have to inform them to Sr. Inspector. After Sr. Inspector confirms and approve them, Sr. Inspector sends email to inform them with specified form to Data Entry Operator.

After the modification and check them, Data Cross Checker sends email to the Sr. Inspector and you. Then you can start to input inspection result.

!! Only for 1st Periodic Inspection in 2018 !!

No need to inform to Data Entry Operator to modify inputted bridge basic data. By approval of Sr. Inspector, Inspector can modify it.

Preparation for Field Inspection

Sl	Bridge Name	Bridge Type	Zone	Circle	Division	Sub Division
1	Borguna Subidkhali Bridge Demo	Box Culvert	Dhaka	Dhaka	Dhaka	Dhaka-1
2	bottoli bridge	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
3	Ddemo matamuhuri	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
4	Demo Amboli	RC Girder Bridge	Dhaka	Dhaka	Dhaka	Dhaka-1
5	demo alia	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
6	demo bandua	RC Girder Bridge	Dhaka	Dhaka	Dhaka	Dhaka-1
7	Demo Choudhury	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
8	demo Kaharol	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
9	Demo Karnafuli	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
10	Demo Kkroy	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
11	Demo Lalu	PC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
12	demo mirja	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
13	demo nandail	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
14	Demo pat bridge	PC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
15	Demo Rahman	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
16	Demo Randhunbari	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
17	demo Rashidpur	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka
18	Demo shamni	RC Girder Bridge	Dhaka	Dhaka	Dhaka	SO-Dhaka

- (a) Click “Prepare Inspection Sheet”.
- (b) Choose “Targeted Bridge” in Periodic Inspection Integrated List and click “New Sheet”.
- (c) Click “Print”. You can get the bridge inventory and last result of inspection of the bridge.
- (d) You bring them to field inspection and note rating of defects into the blanked sheet.

!! Only for 1st Periodic Inspection in 2018 !!

Because this is 1st periodic inspection, last result has not existed.

Therefore, operate from step “e.”

Bridge Inventory

Bridge Inventory consists of following items.

- Bridge basic data with drawings and photos of each view
- Work history
- Element Numbering system
- Field sketch of defects of last periodic inspection
- Defects photos of last periodic inspection
- Last periodic inspection result sheet

(a) Click “Prepare Inspection Sheet”.

(b) Choose “Periodic Inspection” and “Targeted Bridge” in Select a bridge for inspection.

(c) Click “New Sheet”.

(d) Click “Create”.

Note

Blanked sheet has pages as same as No. of Spans. It is necessary to print out all pages.

Preparation to input Inspection Result into BMS

(a) Complete and check the paper documents.

(b) Take PDF Scan Data of Field sketch of defects.

(c) Make Defects Photos sheet with Form of Excel.

You can download the form from link at login page of BMS

(d) Make PDF file of completed Defects Photos sheet.

Input Inspection Result into BMS

- Click “Bridge Inspection”.
- Click “Prepare Inspection Sheet” .
- Choose “Periodic Inspection” and “Targeted Bridge” in Select a bridge for inspection.
- Click “New Sheet”.
- Click “Create”.
- Click “Blank Sheets” in Bridge Inspection.

File Number	INS-Z5064--20180416	Bridge Name	Test Maki 0413 Culvert	Superstructure	Box Culvert	Year	2050																		
Zone	Dhaka	Circle	Dhaka	Division	Dhaka	SAE	SO-Dhaka Sub-division 1 - 2																		
Inspection Date	2018-04-16				Inspector	Admin																			
Survey Result	No. of Cross Beam Line	0			Span Length	3.000	No. of Spans	1 / 2																	
Elements		Steel		Concrete		Others		Common																	
		Corrosion	Crack in Steel	Loose or Missing Bolts	Fracture	Deterioration of Paint System	Crack	Spalling / Exposed Rebar	Water Leakage/ Efflorescence	Fallen out of Deck Slab	Cracking of Deck Slab	Delamination	Abnormal Spacing	Difference in Level	Abnormal Bituminous Pavement	Functional Disorder of Bearings	Other Types of Defects	Defects of Reinforced Materials	Abnormal Anchorage	Decolorization/Deterioration	Water Leakage/Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Deformation/Break	Accumulation of Debris
Head Slab	01																								
Footing	01																								
Side Wall	01																								

(g) Blanked Inspection sheet is displayed.

(h) Input “Rating of Defects” and fill all cells in the sheet. You can input following characters.

<u>Rating of Defects</u>	
➤ “ - ”	: Element doesn't exist in this bridge.
➤ “ N ”	: non visible.
< case 1 >	< case2 >
➤ “ a ”	: no defect
➤ “ b ”	: small defect
➤ “ c ”	: medium defect
➤ “ d ”	: large defect
➤ “ e ”	: existing

Note

Rating of Defects “a” to “e” are defined by each kind of defect. You can refer them to “Appendix of Bridge Inspection Manual” with photos.

Note

If the bridge has multiple spans, you have to input all cells of all spans.

Note

You can use “Save as Draft” function, if you want to stop and discontinue inputting halfway.

(i) When you input “d” or “e”, Inspection Picture Add window is displayed.

Input “Title” and “Description”. And upload a “Image file (JPG)” of the defect.

<u>Inspection Picture Add window</u>	
➤ “Title”	: Input “Element No. , Kind of Defect”.
➤ “Description”	: Note explanation of the situation.
➤ “uploading Image file”	File type : JPG or PNG



(j) After completion to input result, (Display “100% inspection has been completed”)

Note

After inputting rating “b, c, d, e”, you can use “Fill with “a”” function. By clicking “Fill with “a””, blank cells are filled with “a” automatically.

Fill with "a"			
File Number	INS-N105--20180726		
Zone	Barishal	Circle	Pat
Inspection Date	2018-07-28	<input type="button" value=""/>	
Survey Result	No. of Cross Beam Line	5	

(k) Click icon of Attached Documents and upload Field sketch of defects (PDF) and Defects Photos sheet (PDF).

(l) Click icon of Work History and input information as followings,

- Date : choose inspection date
- Type : choose Periodic Inspection.
- Element and Content : input “none”.
- Bridge Rated and Remarks : keep blank.

Summary
Recommendation

Save and Next Submit for review Back

Inspection Pictures
Picture is not available

Attached Documents
Attached Documents is not available

Inspection Comments
Comment is not available

Work History
Work History is not available

(m) You can click “Submit for Review”.

Click “Submit for Review”, then the inputted inspection result sheet is submitted to Sr. Inspector with email (automatically sending system).

Recheck and Modification of Inspection Result

If Sr. Inspector decides that it's necessary to modify or re-study of submitted Inspection Result, Sr. Inspector can require the Inspector to recheck it.

- (a)** You get email from BMS to recheck inputted Inspection Result.
- (b)** Click "Bridge Inspection".
- (c)** Click "Need Recheck (x)". (x) shows number of bridges to be rechecked by you.
- (d)** Recheck and modify if it's necessary.
- (e)** Click "Submit for Review".

6.5.4. Step-by-step instruction for Bridge Sr. Inspector

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Sr. Inspector reviews inputted inspection result by Inspector.

When Inspector click “*Submit for Review*”, email to inform it is sent to Sr. Inspector automatically. At the same time, “*Need Review (x)*” in Bridge Inspection shows (x : number of submitted bridges to review).

(a) Click “Bridge Inspection”.

(b) Click “Submitted for Review (x)”. Bridges submitted you by Inspector are displayed.

(c) Choose “Targeted Bridge”.

(d) Review the result by referring Bridge Inventory, Field sketch of defects (PDF) and Defects Photos sheet (PDF).

Note

Rating of defects “d” and “e” in Inspection Result Sheet shows pop-up photos of the defect by putting mouse cursor on the character.

(e) Click “Recheck” if you find something strange result.

Then email to inform it is sent to Inspector automatically. At the same time, “*Need Recheck (x)*” in Bridge Inspection shows (x : number of submitted bridges to recheck).

(f) Click “Send for Approval” if you don’t find any points to be modified.

Note

When you click “*Send for Approval*”,

- If last Whole Bridge Condition Category (A to D) of the bridge was “A” or “B”, next step is Evaluation by Bridge Evaluator.
- If last Whole Bridge Condition Category (A to D) of the bridge was “C” or “D”, Chief Inspector also reviews the Result of Inspection.

6.5.5. Step-by-step instruction for Bridge Chief Inspector

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp. Evaluator	Public

Chief Inspector reviews bridge inspection result approved by Sr. Inspector if the bridge was scored as “C” or “D” in last inspection.

- (a) Click “Bridge Inspection”.
- (b) Click “For Approval (x)”. Bridges submitted you by Sr. Inspector are displayed.
- (c) Choose “Targeted Bridge”.
- (d) Click “Report Form” and open Inventory of the bridge.
- (e) Check “Entire Bridge Condition Category in Last Periodic Inspection” in the Inventory.
 - >> If the Category is “A” or “B”, skip to (h)..
 - >> If the Category is “C” or “D”, you have to review inspection result of the bridge..
- (f) Review the result by referring Bridge Inventory, Field sketch of defects (PDF) and Defects Photos sheet (PDF).
- (g) Click “Recheck” if you find something strange result. Then email to inform it is sent to Inspector automatically. At the same time, “Need Recheck (x)” in Bridge Inspection shows (x : number of submitted bridges to recheck).
- (h) Click “Sign & Approval” if you don’t find any points to be modified.

6.6 Input and Browsing of Evaluation Result : Bridge Evaluation

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Following flowchart shows outline of “input” and “approval” step of Inspection result in BMS.

You can refer “3.7 Bridge Inspector” to understand types of Inspector in the chart.

This section shows explanation of “Periodic Inspection”.

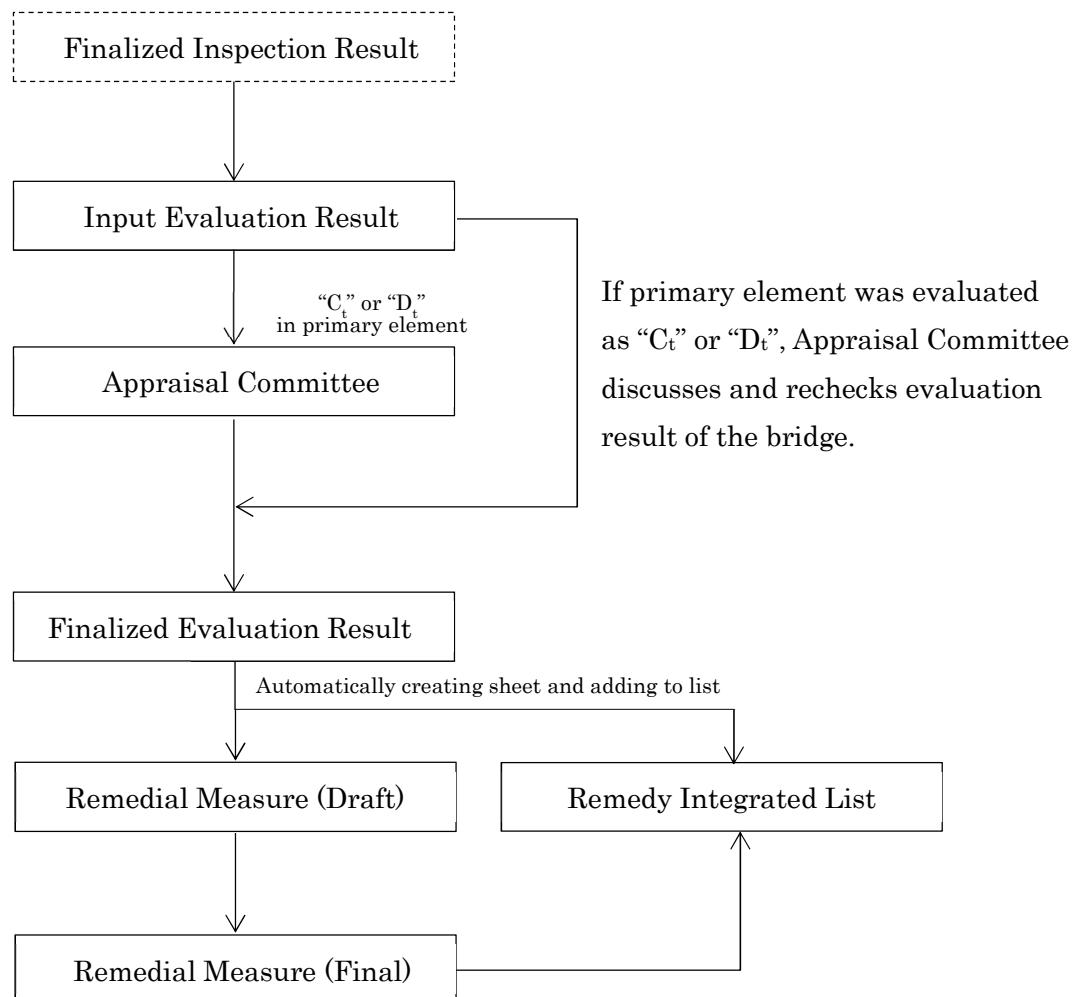


Figure. Flowchart of inputting Evaluation Result into BMS

6.6.1. Preparation to input Evaluation Result

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

It is better to print out following items.

- Inspection Result sheets
- Field sketch of defects
- Defects Photos sheets

6.6.2. Outline of “Bridge Evaluation” page

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

SI	Evaluation Result	Inspection Result	Evaluation Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle	Division	Sub Division	SAE
1			2018-01-01	Final Trial RC Girder Bridge	RC Girder Bridge	Z1029	5.500	005c	Mymensingh	Jamalpur	Sherpur	Sherpur -1	SO-Sherpur Sub
2			2018-01-02	Golora Bridge-3	RC Girder Bridge	N5	45.800	045c	Dhaka	Dhaka	Manikganj	Nayirhat	
3			2018-08-04	Gazikhali Bridge	RC Girder Bridge	N5	42.300	042a	Dhaka	Dhaka	Manikganj	Nayirhat	
4			2018-07-30	Test_Kanchan	RC Girder Bridge	N2	0.000	LRP 64	Dhaka	Narayangong	Narayanganj	Narayanganj-2	SO-Narayanganj St
5			2018-07-30	test somromoti	RC Girder Bridge	N509	5800.000	23+600	Rangpur	Rangpur	Lalmohihat	Lalmohihat	SO-Lalmori
6			2018-07-30	Test Kanchan	RC Girder Bridge	N105	0.000		Dhaka	Narayangong	Narayanganj	Narayanganj-2	SO-Narayanganj St
7			2018-07-30	test iw	RC Girder Bridge	N2	64.250	LRP 064	Dhaka	Narayangong	Narsingdi	Shipbur	SO-Shipb
8			2018-07-30	test additional ojt	RC Girder Bridge	N2	64.250	LRP064	Dhaka	Narayangong	Narsingdi	Shipbur	SO-Shipb
9			2018-07-30										
10													
11													
12		Records per page (50)											
13													
14													

1. Click “Add Temporary Evaluation” to create new evaluation sheet.
2. Click “Blank Sheets” to view all blank evaluation sheets.
3. Click “Draft” to view all draft evaluation sheets.
4. Click “Temporary Final” to view all temporary final evaluation results.
5. Click “Recheck” to view all evaluation sheets sent for recheck.
6. Click “Committee” to view all evaluation results submitted to committee.
7. Click “Unsigned (Evaluator)” to view all evaluation results approved but unsigned by evaluator.
8. Click “Unsigned (Committee)” to view all evaluation results approved but unsigned by committee.
9. Click “Final” to view all final evaluation results approved and signed.
10. Click “Filter” to filter evaluation list.
11. Click “Export” button to download evaluation list in excel format.
12. User can change number of rows to show in list table. Example: 10, 25, 50, 100.
13. User can search bridge by any values of bridge data.
14. Evaluation list view actions:
 - o “Recycle Bin Icon”: Click this icon to delete evaluation sheet.
 - o “Book Icon”: Click this icon to view evaluation results.
 - o “File Icon”: Click this icon to see bridge inventory data.

The screenshot shows the 'BRIDGE EVALUATION' application. On the left, there's a sidebar with 'Back', 'Dashboard', 'Bridges', 'Bridge Details', and 'Final'. Below that are 'Evaluation Integ', 'Filter', and 'Records per page' set to 50. The main area has a title 'Select an inspection sheet for evaluation' and a search bar with 'Search: test'. A red circle labeled '1' highlights the 'Add Temporary Evaluation' button. A red circle labeled '2' highlights the search bar. A red circle labeled '3' highlights the first row in a table. A red circle labeled '4' highlights the 'New Sheet' button. A red circle labeled '5' highlights the 'Cancel' button. The table below shows two entries:

Sl	Inspection Results	Bridge Name	Bridge Type	Zone	Circle	Division	Sub-Division	SAE
1		Test Chandana	RC Girder Bridge	R710	20.000			
2		Test 0728 Makishima Bridge	Steel Girder Bridge	N402	99.500	999z	Mymensingh	Mymensingh

Below the table, it says 'Showing 1 to 2 of 2 entries'. At the bottom right are 'Previous', '1', and 'Next' buttons. The footer has 'Export' and 'Add Temporary Evaluation' buttons.

1. Click “Add Temporary Evaluation”, to create new evaluation sheet.
2. Search bridge from bridge list by name or any other key value.
3. Select a bridge for evaluation.
4. Click “New Sheet” to create new sheets.
5. Click “Cancel” to cancel creating new sheets.

6.6.3. Step-by-step instruction for Bridge Evaluator

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

SI	Action	Evaluation Result	Inspection Result	Evaluation Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle	Division	Sub Division	SAE
1				2018-08-06	Gazikhali Bridge	RC Girder Bridge	N5	42.300	042a	Dhaka	Dhaka	Manikganj	Nayarhat	
2				2018-08-01	Test Balu	RC Girder Bridge	N501	20.000	007	Mymensingh	Jamalpur	Tangail	Tangail	SO-Tan
3				2018-07-30	Test Kazirhat	RC Girder Bridge		0						

- (a) Click “Bridge Evaluation”.
- (b) Click “Add Temporary Evaluation”.
- (c) Choose “Targeted Bridge” in Select an inspection sheet for evaluation and click “New Sheet”.

Note

In Select an inspection sheet for evaluation, bridges agreeing with following all condition are displayed.

- The bridge has finalized inspection result.
- The bridge has not been created Evaluation sheet after scoring above finalized inspection result.

- (d) Click “Blank Sheets”.
- (e) Click “Evaluation Result” of the targeted bridge.

BRIDGE MANAGEMENT SYSTEM (BMS)

EVALUATION EDIT SHEET

Back | Dashboard / Evaluation / Update

100% evaluation has been completed

If you think the defect may do passenger on/under the bridge an injury, check in "Public Safety" box.

If you think it's necessary to carry out Detailed Investigation to get more information and reason of the defect, check in "Detailed Investigation" box.

File Number	EVA-R23-LRP023-20170303	Bridge Name	test_Web_23	Superstructure	Box Culvert	Year	2003			
Zone	Dhaka	Circle	Dhaka	Division	Dhaka	Sub-division	Sub-Division-1, Dhaka			
Evaluation Date	2017-07-11			Evaluator	Admin					
Inspection Result		No. of Cross Beam Line	2	No. of Hinge	1	No. of Span	1 / 1			
Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Choose a category.	Steel	1. Corrosion	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		2. Crack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		3. Loose or Missing Bolts	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		4. Fracture	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		5. Deterioration of Paint System	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	6. Cracking									
	7. Spalling / Exposed Rebar									
	8. Water leakage/Efflorescence									
	9. Fallen out of Deck Slab									
	10. Crack of Deck Slab									
	11. Delamination									
	12. Abnormal Spacing									
	13. Difference in Level									

(f) Blanked Evaluation sheet is displayed.

Check a box of "*Evaluation Category : A_t, B_t, C_t, D_t or N*" for each existing element type.

Evaluation Category

- “A_t” : No Repair
- “B_t” : Minor Repair
- “C_t” : Major Repair
- “D_t” : Emergency
- “N” : Not Visible

(g) If there are defects judged to be remedied emergency for Public safety, check a box of "*Public safety*".

Note

Emergency for Public safety is serious defects to damage road users like pedestrians, vehicles, or pedestrians and passing vehicles under the bridge like as “hard broken railing”, “spalling of concrete deck slab”, “fallen out of concrete deck slab”, “deformation of joint”, “corrosion of light or traffic sign” and so on.

You can refer them to “Appendix-7 of Bridge Inspection Manual”.

(h) If you require Detailed investigation to get more detail information of the defects, check a box of "*Detailed investigation*".

Note

There is a limit to understand the damage cause by visual inspection. Because by visual inspection, causes of the damage and future probable progress cannot be predicted all the time. In that case, the detailed investigation is carried out in order to determine the necessity of rehabilitation and strengthening of the particular bridge.

For example, in areas of airborne salt from the sea, or by long longitudinal crack along the reinforcement bar and PC steel, suspicions of chloride attack are considered.

You can refer them to “6.3 Detailed Investigation of Bridge Inspection Manual”.

(i) After completion to input evaluation category,

- Click “Save as Final” if “C_t” or “D_t” in primary element doesn’t exist.
- Click “Submit to Committee” if “C_t” or “D_t” in primary element exists.

6.6.4. Step-by-step instruction for Appraisal Committee

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Note

Bridge it has serious damage in primary element should be discussed its evaluated result in Appraisal Committee before the evaluation result uploads to BMS as Final.

(a) Click “Bridge Evaluation”.

(b) Click “Committee”.

(c) Choose “Targeted Bridge”.

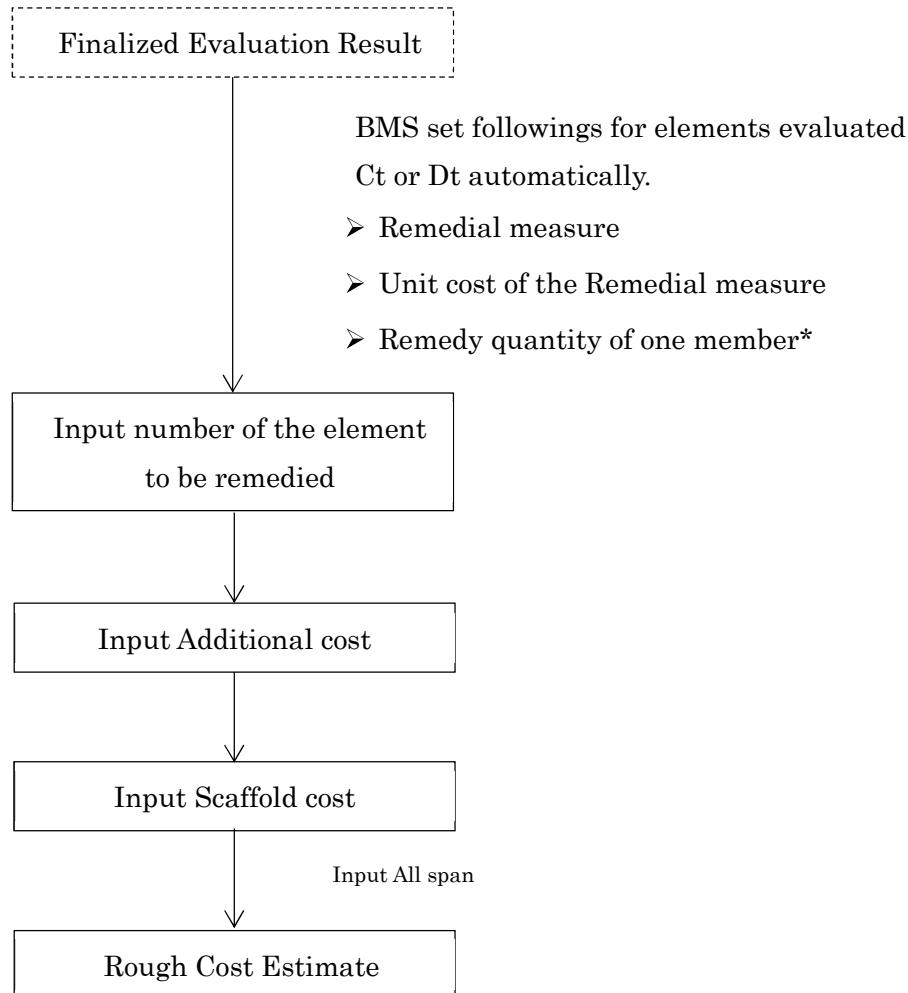
(d) Check and discuss with the EVALUATION APPROVAL SHEET.

(e) Click “Recheck”, “Approval But Sign Later” or “Sign & Approval”.

6.7 Arrangement of Rough Cost Estimate : Bridge Remedial Measure

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Rough cost estimate to remedy the bridge is calculated by following flowchart.



* You can refer 9.5 How to calculate Quantity to Remedy.

6.7.1. Preparation to input remedy information

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

It is better to print out following items.

- Inspection Result
- Field sketch of defects
- Defects Photos sheets

6.7.2. Outline of “Bridge Remedial Measure” page

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

The screenshot shows the 'BRIDGE REMEDIAL MEASURE' page. On the left is a sidebar with icons for Dashboard, Bridge List, Bridge Inspection, Bridge Evaluation, Bridge Remedial Measure (selected), Bridge Remedy List, Tools, and Activity Log. The main content area has a header with tabs: Bridges, Bridge Inspections, Bridge Evaluations, Bridge Remedial Measure (highlighted in blue), Bridge Remedies, and Bridge Data Settings. Below the header is a 'Remedial Measure List' table with columns: SI, Final Count, Result Sheet, Report Form, Evaluation Date, Bridge Name, Bridge Type, Road No, Chainage, LRP Name, Zone, Circle, Division, and Sub Division. The table contains 10 entries. Numbered circles 1 through 7 point to specific features: 1 points to the 'Final' tab, 2 points to the 'Draft' tab, 3 points to the 'Filter' dropdown, 4 points to the 'Records per page' dropdown set to 10, 5 points to the 'Export' button, 6 points to the 'Search' input field, and 7 points to the 'Result Sheet' icon in the first row of the table.

SI	Final Count	Result Sheet	Report Form	Evaluation Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle	Division	Sub Division
1	3			2018-07-26	Addition OUT Bridge	RC Girder Bridge	Z1029	5.500	005c	Mymensingh	Jamalpur	Sherpur	Sherpur -1 SO-I
2				2018-07-25	Test_101	Steel Girder Bridge with Concrete Deck	N105	0.000		Barishal	Patuakhali	Barguna	Barguna
3				2018-05-07	Ddemo matamuhuri	RC Girder Bridge	NS	70.250	70a	Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
4				2018-04-16	Amtola Bailey Bridge	Potable Steel Bridge	R315	0.000	044a	Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
5				2018-04-16	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
6	1			2018-04-13	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
7				2018-04-13	Test Maki 0413 Bridge	RC Girder Bridge	0			Cumilla	Cumilla	Brahmanbaria	Brahmanbaria
8				2018-04-11	Dummy Maki Bridge	RC Girder Bridge	NS	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
9	1			2018-03-08	Ddemo matamuhuri	RC Girder Bridge	NS	70.250	70a	Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
10	1			2018-03-08	demo_dtc_D	RC Girder Bridge	NS	182.362	179b	Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I

1. Click “Draft” to view all draft remedial measure sheets.
2. Click “Final” to view all finalized remedial sheets.
3. Click “Filter” to filter inspection list.
4. User can change number of rows to show in list table. Example: 10, 25, 50, 100, all...
5. Click “Export” button to download remedial measure list in excel format.
6. User can search bridge by any values of bridge data.
7. Remedial measure list view actions:
 - o “Final Count” shows number of times to finalized remedial measure of the bridge.
 - o “Book Icon”: Click this icon to view remedial measure results.
 - o “File Icon”: Click this icon to see bridge inventory data.

6.7.3. Step-by-step instruction for Bridge Evaluator

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

- (a) Click “Bridge Remedial Measure”.
- (b) Click “Draft”.
- (c) Click “Result Sheet” of targeted Bridge. Then **Remedial Measure Edit Sheet** is opened.

< Remedial Measure Edit Sheet >

REMEDIAL MEASURE EDIT SHEET

Back | Dashboard / Remedial Measure / Update

Print this sheet | Print all sheets

File Number	REM-Z1029-005c-20180728	Bridge Name	Additional OJT Bridge		Superstructure	Concrete Bridge	Year	2019				
Zone	Mymensingh	Circle	Jamalpur	Division	Sherrup	Sherpur	SAF	SO-Sherpur Sub Division 1-1				
Re. No.	1	2	3	4	5	6	7	8	9	10	11	12
Span No.		No. of span	/2	Evaluation	Adm.							
Component	Element Type	Material	Type of Defects	Remedy measure	Unit Cost	Unit	Quantity	No. of Element	Subtotal Cost	Additional Cost	Total Cost	
Main Girder	Steel	Steel	1. Corrosion									
			2. Crack in Steel									
			3. Loose or Missing Bolts									
			4. Fracture									
			5. Deterioration of Paint System									
	Concrete	Concrete	6. Crack	Crack Injection	5419	m	108.00	3	1755756	Additional Cost	1755756	
			7. Spalling /Exposed Rebar	Fluid Recasting Mortar	95793	m3	18.00	3	5172822	Additional Cost	5172822	
			8. Water leakage/Efflorescence	None	-	-	0.00	0	0	0	0	
			9. Fallen out of Deck Slab									
			10. Cracking of Deck Slab									
			11. Delamination	None	-	-	0.00	0	0	0	0	0
			12. Abnormal Spacing	None	-	-	0.00	0	0	0	0	0
			13. Difference in Level									
	Others	Others	14. Abnormal Bituminous Pavement									
			15. Functional Disorder of									

- “Component” shows superstructure, substructure, bearing or others.
- “Element Type” shows name of targeted element.
- “Material” shows material type of the element.
- “Type of Defects” shows name of targeted defect.
- “Remedy Measure” is set based on Evaluation category automatically.
- “Unit Cost” is set referring with Remedy measure automatically.
- “Unit” shows unit of the measure like as BDT/m, BDT/m² and so on.
- “Quantity” shows quantity required to be remedied of “one” element.
- “No. of Element” shows number of element to be remedied. User has to input.
- “Subtotal Cost” shows “Unit cost x Quantity x No. of Element”.
- User can arrange Subtotal Cost by inputting “Additional Cost”.
- “Total Cost” shows “Subtotal Cost + Additional Cost” of the combination of remedy.

Common	+ Primary Member	Norset/Vibration	None	-	0.00	0	0	0	0	0		
			22. Abnormal Deflection									
			23. Deformation/Break	None	-	0.00	0	0	0	0		
			24. Accumulation of Debris	None	-	0.00	0	0	0	0		
			25.									
			26. Scouring									
			27. Fard defect									
			13 Scaffold Cost								Scaffold Cost	0
											TOTAL	87618198
											0	87618198
<p style="text-align: center;">14</p> <p style="text-align: center;">Save and Next Save as Final Back</p> <p style="text-align: center;">15 16</p>												

- User has to input manually “Scaffold Cost” for targeted span.
- “TOTAL” shows total cost of targeted span.
- By clicking “Save and Next”, you can save result of targeted span and go to next span.
(Only for multiple span bridge)
- By clicking “Save as Final”, you can save all result of remedial measure.
(You can click this at end span.)

(d) Check the Remedial Measure Edit Sheet, and how many element should be remedied by the remedial measure.

(e) Input “No. of Element” of each combination of element type and defects.

Note

This note shows how to consider “No. of Element” to be remedied.

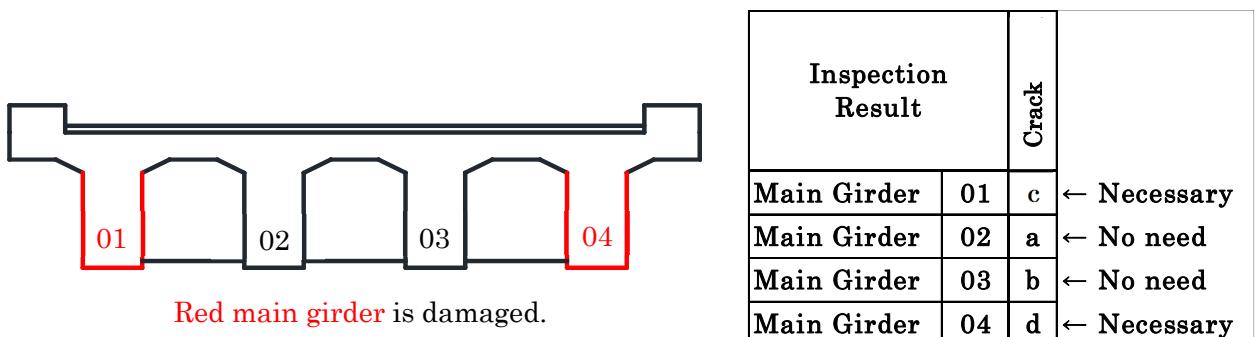
e.g. Serious corrosion of Steel Main Girder

In order to understand how to input No. of Element, it is very important to separate Evaluation category and Rating of defects.

Remedial measure is chosen based on combination of Element Type, Type of Defects and Evaluation category Ct or Dt. Point to be noted is “Not all element of Element type categorized as Ct or Dt is serious damaged”. You can refer following example.

e.g. Concrete Main Girder of RC Girder Bridge (Crack categorized as Dt)

- Evaluator evaluated by referring following inspection result.
Because Main girder 04 has serious damage, Evaluator evaluated as Dt.
- In this case, Main girder 01 and 04 are damaged. **Therefore, the two elements should be remedied.**



- Default figure of No. of Element in Bridge Remedial Measure is same as element number.
- In this case, user should modify it to “2”.

Material	Type of Defects	Remedy measure	Unit Cost	Unit	Quantity	No. of Element	
	6. Crack	Crack Filling	89	m	45.00	4	12

Quantity of ONE element to be remedied.
Default number is “4” (4 main girders). **User should input “2”.**

(e) Input “**Scaffold Cost**” of each combination of element type and defects.

- Scaffold Cost (bottom of Draft remedial measure sheet) requires to input manually by user, because of difficulty to set area of Scaffold automatically.
- Scaffold cost is calculated by following formula.

$$[\text{Unit Cost of Scaffold (tk/m}^2 \text{)}] \times [\text{Span length}] \times [\text{Bridge Width}] \times [\text{ratio of setting area}]$$

Unit cost of Scaffold : Refer Bridge Rehabilitation and Strengthening Manual part 2.

$$= 20,279 \text{ tk/m}^2 \text{ (March 2018)}$$

Span length , Bridge Width : Refer Bridge Inventory.

ratio of setting are : User (mainly Evaluator) considers required area of scaffold to carry out remedy construction like as “all span length”, “1/2 of span length” or “1/4 span length”.



For example of Scaffold

6.8 Browsing Result of BMS : Bridge Remedy List

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

The screenshot shows the 'BRIDGE REMEDY LIST' page. The top navigation bar includes 'Back', 'Dashboard', and 'Bridge Remedy'. Below the navigation is a horizontal menu with tabs: Bridges, Bridge Inspections, Bridge Evaluations, Bridge Remedial Measure, **Bridge Remedies**, and Bridge Data Settings. The 'Bridge Remedies' tab is highlighted. The main content area features a table titled 'Bridge Remedy Integrated List' with columns: Bridge ID, Bridge Length, Bridge Width, Road No., Chainage, Sub-Division, Damage Category, Damage Degree, Importance Degree, Priority to Remedy, Subtotal Cost (BDT), Additional Cost (BDT), Total Cost (BDT), and More. There are five red circles numbered 1 through 5 above the table, corresponding to the tabs in the horizontal menu. Below the table, there are buttons for 'Filter', 'View All', 'Records per page' (set to 10), 'Search' (with placeholder 'sa'), and an 'Export' button. A red circle numbered 6 points to the 'Filter' button, and a red circle numbered 7 points to the 'View All' button. A red circle numbered 9 points to the 'Records per page' dropdown. A red circle numbered 10 points to the 'Search' input field. A red circle numbered 11 points to the 'More' column header. A red circle numbered 8 points to the 'Export' button.

1. Click “All” to view all category bridges.
2. Click “A Category” to view all A category bridges.
3. Click “B Category” to view all B category bridges.
4. Click “C Category” to view all C category bridges.
5. Click “D Category” to view all D category bridges.
6. Click “Filter” to filter remedy list.
7. By default most 50 recent inspections data will show. Click to “View All” to see all remedy list.
8. Click “Export” button to download remedy list in excel format.
9. User can change number of rows to show in list table. Example: 10, 25, 50, 100.
10. User can search bridge by any values of bridge data.

6.9 Data Analysis with Exported Data

In order to create Annual Needs report based on output of BMS, user can use “Excel sheet for annual report.xls”. User can download the excel file from link at top of Dashboard.

- (a) Click “Bridge Remedy List”.
- (b) Confirm “Latest” is enabled.
- (c) Arrange Integrated List with Filter, Records per page and Search.
- (d) Click “Export” to get exported Excel sheet.
- (d) Open the Excel sheet and follow manual in next page.

The screenshot shows the 'BRIDGE REMEDY LIST' page with the 'Latest' filter selected. The main content area shows a table titled 'Bridge Remedy Integrated List' with columns: Latest, All, and A Category. The 'Latest' column is highlighted.

Information	BMS Result of Manikganj Area (1st Periodic Inspection)
Date	2018 Jan 16

1. Input Information and date.

10. Input Budget Amount.

No.	Bridge Name	Bridge Type	Bridge Length	Road No	Chain -age	Sub -Division	SO	Damage Category	Damage Degree	Importance Degree	Priority to Remedy	Subtotal Cost	Additional Cost	Total Cost	Cumulative Repair Cost
1	Gazikhali Bridge	RC Girder Bridge	113.3	8.1	N5	42.300	Nayartat	D	97	95		3,001,951	0	2,112	2,112
2	Colotra Bridge-3	RC Girder Bridge	48.7	8.0	N5	45.800	Nayartat					3,001,951	0	3,001,951	3,004,063
3	Kolta Bailey Bridge	Bailey Bridge with Steel Deck	52.0	3.9	Z5064	11.412	Manikganj					0	126,026	0	3,130,089
4	Kholapara Bridge	RC Girder Bridge	25.4	10.3	R504	18.200	Manikganj					0	0	0	3,130,089
5	Wrisibari Bridge	RC Girder Bridge	13.2	7.9	N5	42.925	Nayartat					3,223	0	0	3,130,089
6	Keliya-1 Bridge	RC Girder Bridge	150.6	7.0	N5	29.010	Nayartat					0	0	0	4,583,323
7	N54014680							B	37	100	62	0	0	0	4,583,412
8	Bynile Bridge							B	56	70	61	0	0	0	4,583,412
9	Bathuli Bridge-3							B	34	100	60	197,184	0	0	4,583,412
10	Kashimnagar Culvert							B	52	70	59	63,236	0	0	4,780,596
11	Bathomuri Bailey Bridge-1	RC Girder Bridge	13.4	8.0	N5	38.800	Nayartat	B	55	65	59	0	0	0	4,845,832
12	Bathuli Bridge-1	Bailey Bridge with Steel Deck	36.7	3.4	Z5064	7.812	Manikganj	B	33	95	58	14,180	0	0	4,845,832
13	Sonarpur Bailey Bridge							B	49	65	55	13,437	0	0	4,860,012
14	Kunduriya Bridge							B	23	100	54	1,570,460	225,000	0	4,860,012
15	Kalampur Bridge-2							A	19	100	52	782,889	150,000	0	5,098,449
16	Kalampur Box Culvert							A	18	100	51	0	0	0	6,818,909
17	Dautiya Bridge-2							B	38	70	51	0	0	0	7,601,798
18	Shantbagh Bailey Bridge							A	17	100	44	0	0	0	8,351,798
19	Sutipara Bridge							A	11	100	43	0	0	0	8,351,798
20	Chakrabarti Bridge-2							A	14	100	43	0	0	0	8,351,798
21	Keliyva Bridge-2							A	8	100	43	0	0	0	8,324,946
22	Baropara Box Culvert 3							A	7	100	44	0	0	0	8,324,946
23	Choto Tora							A	5	100	43	0	0	0	8,324,946
24	Chandra Box							A	5	100	43	0	0	0	8,324,946
25	Sreerampur Bridge-1	RC Girder Bridge	48.7	8.5	N5	35.920	Nayartat	A	5	100	43	0	0	0	9,424,946
26								A	0	100	42	0	0	0	9,424,946
27								A	0	100	40	19,372	0	0	9,424,946
28								A	10	85	40	0	0	0	9,444,318
29								A	0	100	40	578,217	0	0	9,444,318
30								A	0	100	40	0	50,000	0	10,072,535
31								A	0	100	40	0	0	0	10,072,535
32								A	0	100	40	0	0	0	10,072,535
33								A	0	100	40	0	0	0	10,072,535
34								A	0	100	40	0	0	0	10,072,535
35								A	0	100	40	0	0	0	10,072,535
36								A	0	100	40	0	0	0	10,072,535
37								A	0	100	40	0	0	0	10,072,535
38								A	0	100	40	0	0	0	10,072,535
39								A	0	100	40	0	0	0	10,072,535
40								A	0	100	40	0	0	0	10,072,535
41								A	0	100	40	0	0	0	10,072,535
42								A	0	100	40	0	0	0	10,072,535
43								A	0	100	40	0	0	0	10,072,535
44								A	0	100	40	0	0	0	10,072,535
45								A	0	100	40	0	0	0	10,072,535

2. Copy "Column B to P" of exported excel sheet.
 3. Click "D7" cell.
 4. Right click and Paste it as "Value (V)"

5. Select all cells of column "P" from "P7" inputted.

6. Click "Data".

7. Click "Data Tools".

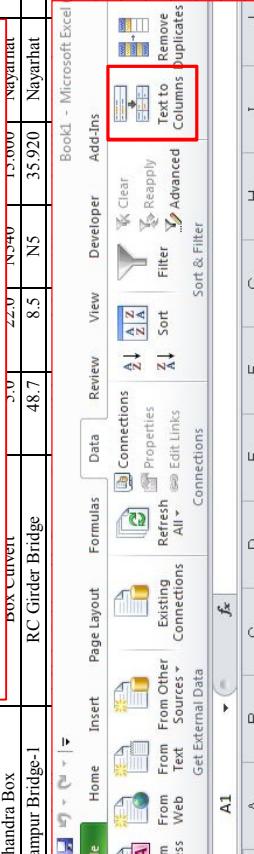
8. Click "Text to Columns"

9. Click "Finish".

Operation 5. to 9. is necessary for "Q" and "R".

Operation 5. to 9. has done

for column "P".



If Cumulative repair cost is over than "Budget Amount", the cell are colored.

Operation 5. to 9. has not done yet for column "Q and R".

<i>Information</i>	<i>BMS Result of Manikganj Area (1st Periodic Inspection)</i>
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11. Choose "Remove" or "Not" to calculate Cost of rebuilding the bridge.
If you don't have any idea now, choose "Remove". (default)

You can Compare with cost to Remedy

The cell of more expensive method is colored and reconstructed.

- Each cost is calculated as following,
 - > Remedy cost / 20 lifespan year (default)
 - > Rebuilt cost / 50 lifespan year (default)

YUD CAVI ALI ALI GIGI EKA UWI WESPAJI YADI.

97.0	Concrete	118,212,000	118,212,000	236,424
------	----------	-------------	-------------	---------

0.0 Concrete 0 0

12. Choose Material of new bridge
"Concrete" or "Steel" + calculate Cost

of rebuilding the bridge.
If you don't have any idea now,
choose "Concrete" (default)

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7. HOW TO USE BMS FOR EACH STEP (ROUTINE)

This chapter shows “How to use BMS in Routine inspection” focused on each step of BMS management.

7.1 Outline of BMS in Routine inspection

Routine inspection is simple site inspection to check level of safety and ensure appropriate serviceability on and under the bridge. Inspector inspects the bridge by following Routine inspection sheet and checks “Yes / No” for each item in the sheet.

Result of Routine inspection is out of target to calculate “priority to remedy” and “Rough cost estimate”.

7.2 Input and Browsing of Inspection Result : Bridge Inspection

7.2.1. Preparation to input Inspection Result.

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

- Bridge inventory sheet (paper)
- Routine Inspection sheet (paper)

7.2.2. Outline of “Bridge Inspection” page

You can find “Routine Inspection Integrated List” at bottom of Bridge

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

The screenshot shows a web-based application interface for bridge inspection. At the top, there are three tabs: "Final" (highlighted in red), "Draft", and "Blank Sheets". Below these are buttons for "Prepare Inspection Sheet" (labeled 1) and "Blank Sheets" (labeled 2). A "Filter" button (labeled 5) is located above a dropdown menu for "Records per page" set to 10 (labeled 6). To the right of the filter is a "Search" input field (labeled 7). The main area displays a table of bridge inspection data with columns: SI, Inspection Result, Report Form, Inspection Date, Bridge Name, Bridge Type, Road No, Chainage, LRP Name, Zone, Circle, Division, Sub Division, SAE, and Map. The table contains three entries. At the bottom left is a message "Showing 1 to 3 of 3 entries" (labeled 8). At the bottom right are "Previous" and "Next" buttons (labeled 9).

SI	Inspection Result	Report Form	Inspection Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle	Division	Sub Division	SAE	Map
1			2018-06-26	Arpara Culvert-2	Box Culvert	N5	74.218	74a	Dhaka	Dhaka	Manikganj	Manikganj		
2			2018-06-25	Amtola Bailey Bridge	Potable Steel Bridge	R315	0.000	044a	Dhaka	Dhaka	Manikganj	Nayirhat		
3			2018-06-13	demo_bridge_test	Mixed Material Bridge	Z5061	0.000	055c						

1. Click “**Prepare Inspection Sheet**”, Select “Routine” and click create.
2. Click “**Blank Sheets**” to view all blank inspection sheets.
3. Click “**Draft**” to view all draft inspection sheets.
4. Click “**Final**” to view all inspection sheets approved and signed.
5. Click “**Filter**” to filter inspection list.
6. User can change number of rows to show in list table. Example: 10, 25, 50, 100, all...
7. User can search bridge by any values of bridge data.
8. Inspection list view actions:
 - “**Book Icon**”: Click this icon to view inspection results.
 - “**File Icon**”: Click this icon to see bridge inventory data.
9. Click “**Next**” to see next page. Click “**Previous**” to see previous page.

7.2.3. Step-by-step instruction

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

Preparation for Field Inspection

SI	Inspection Result	Report Form	Inspection Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle	Division	Sub Division	SAE	Map
1			2018-06-26	Arpara Culvert-2	Box Culvert	N5	74.218	74a	Dhaka	Dhaka	Manikganj	Manikganj		
2			2018-06-25	Amtola Bailey Bridge	Potable Steel Bridge	R315	0.000	044a	Dhaka	Dhaka	Manikganj	Nayorhat		
3			2018-06-13	demo_bridge_test	Mixed Material Bridge	Z5061	0.000	055c						

Showing 1 to 3 of 3 entries

Records per page: 10 | Search: | Previous | Next |

- (a) Click “Bridge Inspection”.
- (b) Choose “Targeted Bridge” in Routine Inspection Integrated List and click “Inspection Form”.
- (c) Click “Print”. You can get the bridge inventory and last result of inspection of the bridge.
- (d) You bring them to field inspection and note rating of defects into the blanked sheet.
- (e) Click “Prepare Inspection Sheet” .
- (f) Choose “Routine Inspection” and “Targeted Bridge” in Select a bridge for inspection.

SI	Bridge Name	Bridge T

- (g) Click “New Sheet”.
- (h) Blanked Inspection sheet is displayed. Click “Create”.

Preparation to input Inspection Result into BMS

- (i) Complete and check the paper documents.

Input Routine Inspection Result into BMS

- (j) Click “Blank Sheets” in Bridge Inspection.
- (k) Click “Inspection Result” of the targeted Bridge.

ROUTINE INSPECTION FORM

Back | Dashboard / Inspection / View

File Number	INS-Z1029-005c-20180728			Inspector	Admin	Date	2018-07-28 <input type="button" value="Calendar"/>
Zone	Mymensingh	Circle	Jamalpur	Division	Sherpur	Sub-Division	Sherpur -1
Road No.	Z1029	Road Name	unknown			GPS	Lat 89° 59' 59" Long 12° 59' 59"
Bridge Name	Additional OJT Bridge		LRP+Offset (m)	500		Chainage (m)	5.500
						Span No.	2
Inspection Elements (*Refer to bottom of form)	Problem (Yes/No)	Rectified (Yes/No)	Maintenance Required (Yes/No)	Inspection Required (Yes/No)	Location and Comments		
Deck Surface							
1 Deck Surface							
• Difference in Level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Abnormal bituminous pavement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Accumulation of debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
2 Expansion Joints							
• Material defects*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Abnormal spacing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Accumulation of debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Abnormal anchorage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Abnormal deflection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Deformation /break	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
9 Drainage system							
• Material Defects*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Water leakage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Deformation /break	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
• Accumulation of debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Material *	Defects description						
Concrete	Crack, spalling/exposed rebar, waterleakage/efflorescence, delamination						
Steel	Corrosion, crack in steel, loose or missing bolt, fracture, deterioration of paint system						
General Comments							
<input type="text"/>							

- (l) Check each cell in the sheet if the result is “Yes”.

- (m) Input the Locations and Comments if necessary,

- (n) After inputting, click “Save as Final”.

Note

If you want to save without saving as Final, you can click “Save”. You can continue input of the bridge at Draft tag.

8. HOW TO USE BMS IN OTHER INSPECTION

This chapter shows how to use BMS in “Interim inspection”, “Emergency Inspection” and “Detailed Investigation”. Those inspections are not scheduled inspection, and BMS doesn’t have the form for them.

8.1 Interim Inspection

Interim Inspection is defined in Inspection and Evaluation Manual as following,

➤ Purpose

To monitor a particularly known or suspected deficiency between the periodic inspections and serves as a supplement of the periodic inspection.

➤ Scope

To monitor a particularly known or suspected deficiency discovered during periodic inspection, such as foundation settlement or scour, significant member deterioration, or the public's use of a load-posted bridge

➤ Example:

Bridges posted for a weight limit less than the legal weight limit.

The sign of rapid deterioration of a particular bridge element.

Bridges with potential foundation problems such as scour.

Result of the Interim inspection of the bridge is created as a report (PDF). The Inspector has to upload it into BMS.

(a) Click “Bridge Inspection”.

(b) Click “Prepare Inspection Sheet” and create periodic inspection sheet of targeted bridge.

(c) Open the blank inspection sheet, and click icon of “Attached Document”.



(d) Upload the report PDF.

(e) Input “This is result of Interim Inspection on (Date)” at “Summary” bottom of the sheet.

(f) Click icon of “Work History” and input information.



(g) Click “Fill with a”. After that click “Submit for Review”. If the bridge is multiple span bridge, click “Save and Next” and fill with “a” all sheet.

(h) Senior inspector and Chief inspector give approval. Evaluation is not necessary.

8.2 Emergency Inspection

Emergency Inspection is defined in Inspection and Evaluation Manual as following,

Emergency Inspection is carried out whenever there is a natural disaster such as flooding, heavy rain, earthquake, landslide, or large accidents such as collision by vehicle/ship or fire or serious accidents on the bridge.

➤ Purpose

To confirm that the bridges remain safe for use or to determine the necessary urgent remedial action required to either ensure the safety of the bridge or to restore the function of the bridge.

Result of the Interim inspection of the bridge is created as a report (PDF). The Inspector has to upload it into BMS.

➤ Scope

The following measures should be taken in addition to collecting the additional information.

To judge the severity of the defect, design documents, as built drawings and a history of maintenance works carried out earlier should be reviewed.

Following investigation and measurement of the defects to the bridges needs to be carried out on site. With this information a decision will be required whether the bridge will needed to be closed to ensure the safety of public traffic.

Because Emergency inspection should be carried out as quickly as possible, Result of the Emergency inspection of the bridge is usually easy report (PDF). The Inspector has to upload it into BMS.

➤ Procedure to upload the report to BMS is same as 8.1 Interim Inspection.

8.3 Detailed Investigation

Detailed Investigation is defined in Inspection and Evaluation Manual as following,

➤ Purpose

To investigate defect causes or structural condition, behavior or to assess damaged structural components for repair/rehabilitation.

➤ Scope

The following objectives are covered by detailed investigation.

To grasp detailed behavior and actions of defect

To monitor the progress of any defect

To investigate the cause of defect

To test and evaluate material quality or strength

To evaluate structural strength

Result of the Emergency Investigate of the bridge is created as a report (PDF). The Inspector has to upload it into BMS.

➤ Procedure to upload the report to BMS is same as 8.1 Interim Inspection.

9. TECHNICAL NOTE

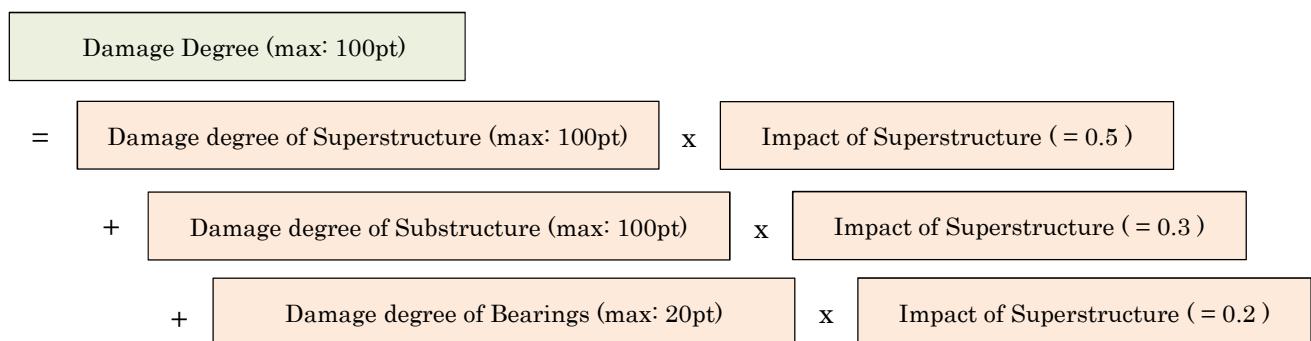
9.1 How to calculate Damage Degree

Damage degree of combination of “each defect and each element” are calculated based on “Evaluation Category”, “Weight Coefficient of each component”, “Weight Coefficient of each element” and “Weight Coefficient of each type of defects”.

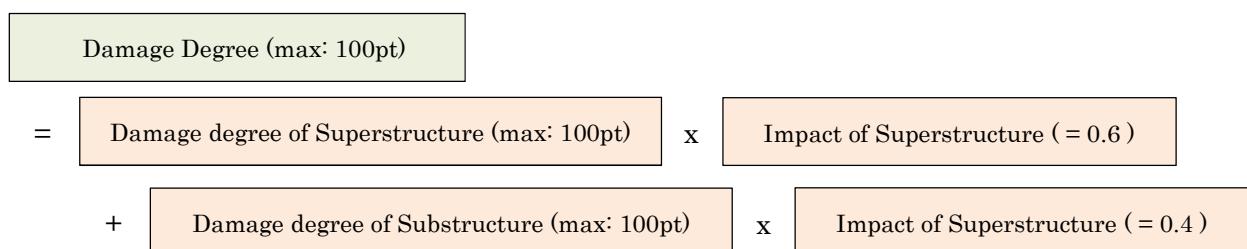
Current two “Weight coefficients” are defined based on manuals in Japan. Because situation of bridge is different between Bangladesh and Japan, the “Weight coefficient” should be upgraded to fit situation in Bangladesh.

Damage Degree of the bridge is calculated by following rule,

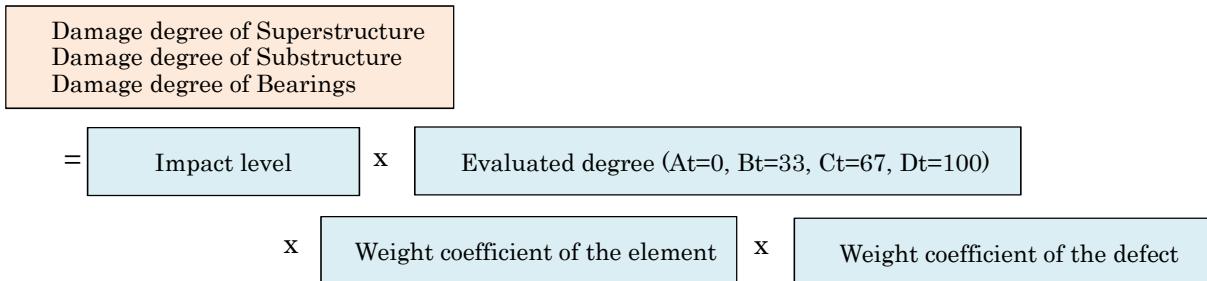
1) Bridge Type with Bearings



2) Bridge Type without Bearings



Each Damage degree of component is calculated with “ Impact level ” , “Evaluated degree (Numerical value of the Evaluated Condition Category of the Elements.)” , “Weight coefficient of the element” and “Weight coefficient of the defect” (Figure 6.4).



The Damage degree of each component is calculated by following formula,

“Weight of Component” x

Total score of (“Weight Coefficient by element” x “Weight Coefficient by type of defects”)

$$\begin{aligned}
 & \boxed{\text{Damage Degree of superstructure in first span}} = \\
 & \boxed{\text{Impact level of Component superstructure}} \times 0.5 \times \{1.00 \times 0.50 \times 33 + \\
 & \quad 0.80 \times 0.75 \times 67\} \\
 & \quad = 0.5 \times (16.5 + 40.2) = \boxed{28 \text{ pt}}
 \end{aligned}$$

$$\left. \begin{array}{c} \boxed{\text{Coefficient of Element Main Girder}} \times \boxed{\text{Coefficient of Type of defect Corrosion}} \times \boxed{\text{Evaluated degree Bt}} \\ \boxed{\text{Coefficient of Element RC Slab}} \times \boxed{\text{Coefficient of Type of defect Crack of Slab}} \times \boxed{\text{Evaluated degree Ct}} \end{array} \right\} +$$

The procedure to calculate Bridge Damage Degree is as follows,

- 1) "Damage degree" = "Impact level of Component" x "Weight of Element Types"
x "Weight of Defect" x "Evaluated degree"
- 2) "Total 1" = Σ ("Damage degree" focused on each Element Types and each Span No.)
- 3) "Total 2" = largest "Total 1" among spans in the Element Types
- 4) "Total 3" = Σ ("Damage degree" focused on each component)
(If point of Total 3 is larger than "Max pt." of each component, it is revised to the Max pt.)
- 5) "Bridge Damage Degree" = Σ ("Total 3" of each component)

Component		Element Types		Span No.	Defect		Evaluated degree	Damage degree	Total 1	Total 2	Total 3
Max pt	Impact		weight			weight					
Super-structure	50	Main girder	1.00	1	Corrosion	0.60	C → 67	21	1	25	40
					Missing bolt	0.20	B → 33	4		25	
				2	Corrosion	0.60	B → 33	10	10		
		Cross beam	0.25	1	Corrosion	0.60	B → 33	3	3	3	40
				2	none	0.00	A → 0	0	0		
		Deck slab	0.80	1	Cracks	0.75	B → 33	10	10+2=	12	37
					Efflorescence	0.13	B → 33	2	12		
				2	Cracks	0.75	B → 33	10	10		
Sub-structure	30	Abutmenet	0.67	1	Cracks	0.43	B → 33	3	3	8	30
					Cracks	0.43	C → 67	6		8	
				2	Efflorescence	0.29	B → 33	2			
		Pier	0.67	1	Cracks	0.43	C → 67	6	8	8	30
					Efflorescence	0.29	B → 33	2			
		Foundation	1.00	1	Scouring	1.00	C → 67	21	21	21	30
				2	none	0.00	A → 0	0	0		
Bearings	20	Bearing	1.00	1	none	0.00	A → 0	0	0	5	5
									Bridge Damage Degree	75	

As total point of substructure (37pt) is larger than max point of substructure (30pt), TOTAL POINT is revised to 30pt.

Following 3 tables shows Example of " Single span RC Girder Bridge."

Total Damage point of superstructure = 46

Total Damage point of substructure = 21

Total Damage point of bearing = 20 $46pt + 21pt + 20pt = 87pt$

SUPERSTRUCTURE	Weight Coefficient of Element (A)		Weight Coefficient of Defects (B)		Converted Evaluated Score (C)		Damage Point (A)x(B)x(C)
	Main Girder	1.00	Cracking	0.33	Bt	33	10.89
Cross Beam	1.00	Spalling	0.67	Bt	33	22.11	
	1.00	Water leak	0.17	Bt	33	5.61	
	1.00	Delamination	0.17	Bt	33	5.61	
	1.00	Discolor	0.03	Bt	33	0.99	
	0.25	Cracking	0.40	Bt	33	3.30	
Deck Slab	0.25	Spalling	0.60	Bt	33	4.95	
	0.25	Delamination	0.20	Ct	67	3.35	
	0.25	Discolor	0.05	Bt	33	0.41	
	0.80	Fallen out	1.00	Bt	33	26.40	
Sub Damage point of Superstructure	0.80	Crack of DS	0.25	Bt	33	6.60	
	0.80	Delamination	0.03	Bt	33	0.79	
	Total Damage point of Superstructure				X _{dd} = 0.50	46	X _{dd} x (D)
Maximam point = X _{dd} x 100 = 50 > 46 ok							

SUBSTRUCTURE	Weight Coefficient of Element (A)		Weight Coefficient of Defects (B)		Converted Evaluated Score (C)		Damage Point (A)x(B)x(C)
	Abutment	0.67	Cracking	0.43	Ct	67	19.30
Foundation	0.67	Spalling	0.57	Bt	33	12.60	
	0.67	Water leak	0.29	Bt	33	6.41	
	0.67	Delamination	0.14	Bt	33	3.10	
	0.67	Discolor	0.14	Bt	33	3.10	
	0.67	Water leak	0.14	Bt	33	3.10	
	1.00	Cracking	0.40	Bt	33	13.20	
Sub Damage point of Substructure	1.00	Spalling	0.30	Bt	33	9.90	
	Total Damage point of Substructure				Y _{dd} = 0.30	21	Y _{dd} x (D)
	Maximam point = Y _{dd} x 100 = 30 > 21 ok						

BEARING	Weight Coefficient of Element (A)		Weight Coefficient of Defects (B)		Converted Evaluated Score (C)		Damage Point (A)x(B)x(C)	
	Bearing	1.00	Corrosion	0.25	Bt	33	8.25	
Sub Damage point of Bearing	1.00	Crack	1.00	Bt	33	33.00		
	1.00	Missing bolt	0.50	Bt	33	16.50		
	1.00	Fracture	1.00	Bt	33	33.00		
	1.00	Paint system	0.25	Bt	33	8.25		
	1.00	Disorder of B	0.75	Bt	33	24.75		
	1.00	Debris	0.25	Bt	67	16.75		
	1.00	Settlement	0.50	Bt	67	33.50		
	Bearing	0.25	Cracking	0.14	Bt	33	1.16	
Total Damage point of Bearing	Seat	0.25	Break	0.29	Bt	33	2.39	
	Sub Damage point of Bearing				Z _{dd} = 0.20	36	Z _{dd} x (D)	
	Maximam point = Z _{dd} x 100 = 20 < 36 20							

You can refer "Bridge Inspection and Evaluation Manual 6.2 Evaluation of Entire Bridges" for detail information of this issue.

Weight Coefficient by Component

Table 6.6 Impact level of Component (Bridge type with bearings)

Component	Impact level *)	Details
Superstructure	0.5	This damage directly impacts bridge function.
Substructure	0.3	Compared to superstructure, the impact of this damage to bridge function is not great as the size of the structure is large.
Bearings	0.2	The impact of this damage to bridge function is not great.

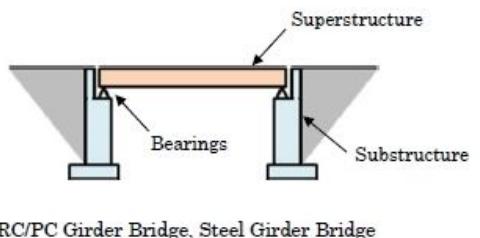
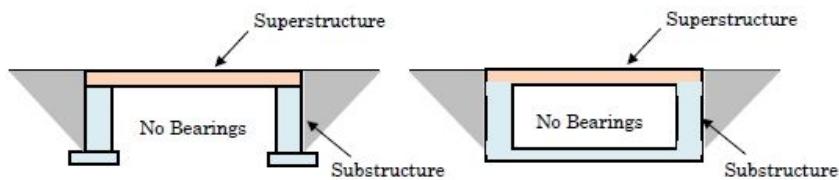


Table 6.7 Impact level of Component (Bridge type without bearings)

Component	Impact level	Details
Superstructure	0.6	This damage directly impacts bridge function.
Substructure	0.4	Compared to superstructure, the impact of this damage to bridge function is not great as the size of the structure is large.



Small Slab Bridge (Former "Slab Culvert") Box Culvert

Weight Coefficient by Element

Table 6.9 Weight coefficient of the element

Component	Element Types	Weight coefficient *)
Superstructure	Main Girder Main Truss Main Arch Outer Cable Main tower Arch Rib	1.00
	Cross Beam Stringer	0.25
	Deck Slab	0.80
	Abutment Pier Side Wall Parapet Wall	0.67
	Foundation footing	1.00
Bearings	Bearing Main Body Anchor Bolts	1.00
	Bearing Seat Bearing Bed	0.25

*) Adopted by the local government of Japan

Weight Coefficient by type of defects (Superstructure)

----- Superstructure -----

[Deck - Steel]

Type of defects	Weight coefficient
1.Corrosion	0.50
2.Crack in Steel	1.00
3.Loose or Missing Bolts	0.17
4.Fracture	1.00
5.Deterioration of Paint	0.17
21.Abnormal Noise / Vibration	0.17
23.Deformation / Break	0.17

* When "Crack in Steel and Fracture" is occurred, the Weight coefficient is set as to be 1.0

[Deck - Concrete]

Type of defects	Weight coefficient
7.Spalling / Exposed Rebar	0.10
8.Water leakage /Efflorescence	0.10
9.Fallen out of Deck Slab	1.00
17.Defects of Reinforcing Material for Rehabilitation / Strengthening	0.25
10.Crack of Deck Slab	0.75
11.Delamination	0.03
18.Abnormal Anchorage	0.25
19.Discolorlation / Deterioration of Material	0.03

* When "Fallen out of Deck Slab" is occurred, the Weight coefficient is set as to be 1.0

[Main Girder - Steel]

Type of defects	Weight coefficient
1.Corrosion	0.60
2.Crack in Steel	1.00
3.Loose or Missing Bolts	0.20
4.Fracture	1.00
5.Deterioration of Paint	0.20
12.Abnormal Spacing	0.20
21.Abnormal Noise / Vibration	0.20
22.Abnormal Deflection	0.20
23.Deformation / Break	0.20

* When "Crack in Steel" and "Fracture" is occurred, the Weight coefficient is set as to be 1.0

[Main Girder - Concrete]

Type of defects	Weight coefficient
6.Crack	0.33
7.Spalling / Exposed Rebar	0.67
8.Water leakage /Efflorescence	0.17
17.Defects of Reinforcing Material for Rehabilitation / Strengthening	0.30
11.Delamination	0.17
12.Abnormal Spacing	0.17
18.Abnormal Anchorage	0.67
19.Discolorlation / Deterioration of Material	0.03
21.Abnormal Noise / Vibration	0.50
22.Abnormal Deflection	0.30
23.Deformation / Break	0.03

* When "Crack + Spalling / Exposed Rebar" is occurred, the Weight coefficient is set as to be 1.0

[Cross Beam - Steel]

Type of defects	Weight coefficient
1.Corrosion	0.33
2.Crack in Steel	1.00
3.Loose or Missing Bolts	0.17
4.Fracture	1.00
5.Deterioration of Paint	0.17
21.Abnormal Noise / Vibration	0.33
23.Deformation / Break	0.17

* When "Crack in Steel" and "Fracture" is occurred, the Weight coefficient is set as to be 1.0

[Cross Beam - Concrete]

Type of defects	Weight coefficient
6.Crack	0.40
7.Spalling / Exposed Rebar	0.60
8.Water leakage /Efflorescence	0.40
17.Defects of Reinforcing Material for Rehabilitation / Strengthening	0.40
11.Delamination	0.20
18.Abnormal Anchorage	0.80
19.Discolorlation / Deterioration of Material	0.05
21.Abnormal Noise / Vibration	1.00
23.Deformation / Break	0.05

* When "Crack + Spalling / Exposed Rebar" is occurred, the Weight coefficient is set as to be 1.0

Weight Coefficient by type of defects (Substructure)

----- Substructure -----

【Abutment / Pier - Steel】

Type of defects	Weight coefficient
1.Corrosion	0.60
2.Crack in Steel	1.00
3.Loose or Missing Bolts	0.20
4.Fracture	1.00
5.Deterioration of Paint	0.20
20.Water Leakage / Puddle	0.20
21.Anormal Noise / Vibration	0.20
23.Deformation / Break	0.20

※When "Crack in Steel" and "Fracture" is occurred, the Weight coefficient is set as to be 1.0

【Abutment / Pier - Concrete】

Type of defects	Weight coefficient
6.Crack	0.43
7.Spalling / Exposed Rebar	0.57
8.Water leakage /Efflorescence	0.29
17.Defects of Reinforcing Material for Rehabilitation / Strengthening	0.57
11.Delamination	0.14
19.Discolorlation / Deterioration of Material	0.14
20.Water Leakage / Puddle	0.14
23.Deformation / Break of Structure Element	0.14

※When "Crack + Spalling / Exposed Rebar" is occurred, the Weight coefficient is set as to be 1.0

【Foundation】

Type of defects	Weight coefficient
25.Settelment / Tilt / Movement	0.25
26.Scouring	1.00

※When "Scouring" is occurred, the Weight coefficient is set as to be 1.0

Weight Coefficient by type of defects (Bearing)

----- Bearings -----

【 Bearing - Steel】

Type of defects	Weight coefficient
1.Corrosion	0.25
2.Crack in Steel	1.00
3.Loose or Missing Bolts	0.50
4.Fracture	1.00
5.Deteriorasian of Paint	0.25
15.Functional Disorder of Bearings	0.75
20.Water Leakage / Puddle	0.25
23.Deformation / Break of Structure	0.25
24.Accumulation of Debris	0.25
25.Settelment / Tilt / Movement	0.50

*When "Crack in Steel" and "Fracture" is occurred, the Weight coefficient is set as to be 1.0

【 Bearing - Rubber】

Type of defects	Weight coefficient
15.Functional Disorder of Bearings	1.00
20.Water Leakage / Puddle	0.25
23.Deformation / Break	0.13
24.Accumulation of Debris	0.13
25.Settelment / Tilt / Movement	0.88

*When "Function Disorder of Bearings" is occurred, the Weight coefficient is set as to be 1.0

【 Bearing Seat/Bed - Concrete】

Type of defects	Weight coefficient
6.Crack	0.14
11.Delamination	0.29
23.Deformation / Break	1.00

*When "Deformation / Break of Structure Element" is occurred, the Weight coefficient is set as to be 1.0

9.2 How to calculate Importance Degree

Importance degree is score calculated by the bridge's influence in the area. This degree is calculated as high point if surrounding area and traffic network receives serious damage because the bridge is closed or falls down.

Importance degree is calculated as total score of following 4 items.

- **Class of Road :**

e.g.

If the bridge locating on National road falls down, traffic network in the area gets serious damage. Therefore, high score set for high class road.

- **Traffic Volume**

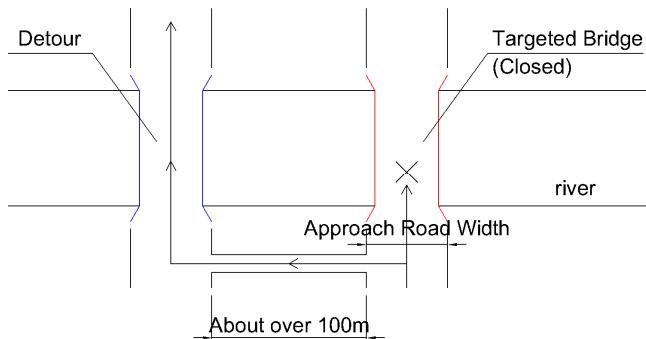
e.g.

If the bridge with large traffic volume falls down, traffic network in the area gets serious damage. Therefore, high score set for large traffic volume.

- **Detour/Alternate Route**

e.g.

If the bridge falls down and there is no another bridge (Detour) near fallen bridge, it become difficult to cross the river or road. Therefore, high score set for bridge without Detour.



- **Crossing under the Bridge**

e.g.

If the bridge falls down and Railway or National road are going through under the bridge, traffic impact to around the area is serious. Therefore, high score set for bridge important traffic network existing. On the other hand, If under the bridge is river or swamp, this score is low.

Score of current BMS is shown in next page.

[Class of Road]

Maximum score is “30”.

Name	Score
National Road	30
Regional Road	20
Zilla Road	5
Others	0

[Traffic Volume]

Maximum score is “25”.

Name	Score
Over 20,000	25
15,000 to 20,000	20
10,000 to 15,000	15
5,000 to 10,000	10
1,000 to 5,000	5
Under 1,000	0

Note

Total score of Maximum score of each items should be always 100.

- Class of Road : max. 30
- Traffic Volume : max. 25
- Detour : max. 15
- Crossing under bridge : max .30

$$30pt + 25pt + 15pt + 30pt = 100pt$$

[Detour/Alternate Route]

Maximum score is “15”.

Name	Score
Detour doesn't exist	15
Detour exists	0

[Crossing under the Bridge]

Maximum score is “30”.

Name	Score
Railway	30
National Road	25
Regional Road	20
Zilla Road	15
Under Pass	10
Chanel	5
Cross Drainage	5
Swamp Land	3
River	1
Others	0
Unknown	0

9.3 How to calculate Priority to Remedy

Priority Remedy is calculated by following formula.

$$\begin{array}{c} \text{Priority to Remedy (max: 100pt)} \\ = \quad \boxed{\text{Damage degree (max: 100pt)}} \times \boxed{\text{Impact X } (= 0.6)} \\ + \quad \boxed{\text{Importance Degree (max: 100pt)}} \times \boxed{\text{Impact Y } (= 0.4)} \end{array}$$

In the future, above Impact X and Y should be arranged to fit Bangladesh situation.

System manager can arrange them by editing source code,

9.4 How to choose Remedial Measure

Remedial measure is chosen by combination of “Evaluation Category” and “Type of Defects”.

Targeted remedy measure is shown as following table.

e.g. Main Girder (Steel or Concrete)

Type of Defects	Evaluation Category	
	Ct	Dt
Corrosion	Repainting	Supplementing Plate
Crack in Steel	Stop hole + Supplementing Plate	Stop hole + Supplementing Plate
Cracking (Concrete)	Crack Injection	Carbon Fiber Sheet Bonding on Concrete
Spalling / Exposed Rebar	Hand Applied Mortar	-
⋮	⋮	⋮

You can refer all rules of Remedy measure by Appendix TABLE OF SETTINGS IN BMS of this manual.

Note

Some of combination of defect and element don't have remedy measure because of following reason,

- The remedy cost is very cheap comparing with total cost generally.
- The defect is solved by other remedial measure for other defect.,

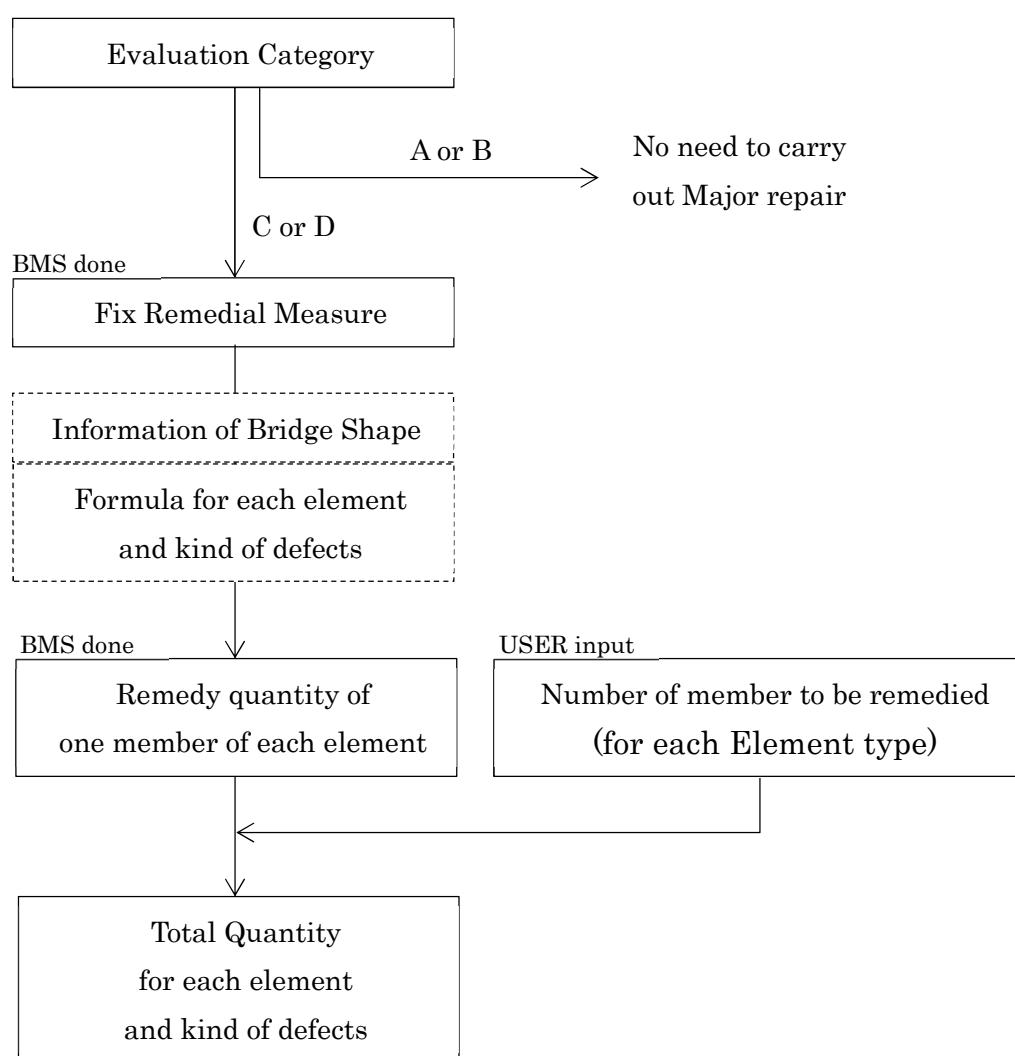
9.5 How to Calculate Quantity to Remedied

Quantity of each member to be remedied are necessary to calculate cost of Remedial Cost.

For example, “Repainting of Steel Member” is required “Area (m²) of deteriorated painting system”, “Crack Injection” of concrete slab deck is required “Length (m) of cracking”.

However, some of defect scale are difficult to measure in site investigation, because of impossibility to carry out Close-up visual inspection.

Therefore, BMS calculates the quantity automatically by referring information of “Bridge Shape in Bridge Info” and “Rating of Defects” and applying them into the formula set in system.



You can refer “Formula for each element and kind of defects” and “Quantity coefficient” by Appendix TABLE OF SETTINGS IN BMS of this manual.

Note

“Formula for each element and kind of defects” is calculated by following rules.

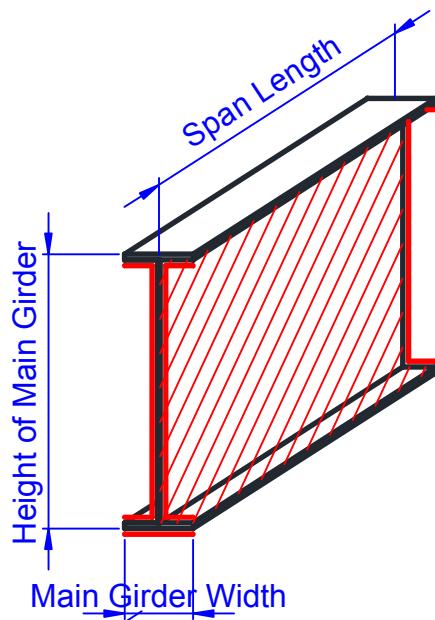
e.g.1 Repainting of Steel I-Girder

- Deterioration of Paint system Ct
- Area to repaint (m²)
- All area of the Main girder

1.0 x ← coefficient

$$(MG\ Width\ x3 + Height\ of\ MG\ x2) \times Span\ Length$$

: Basic Formula 207



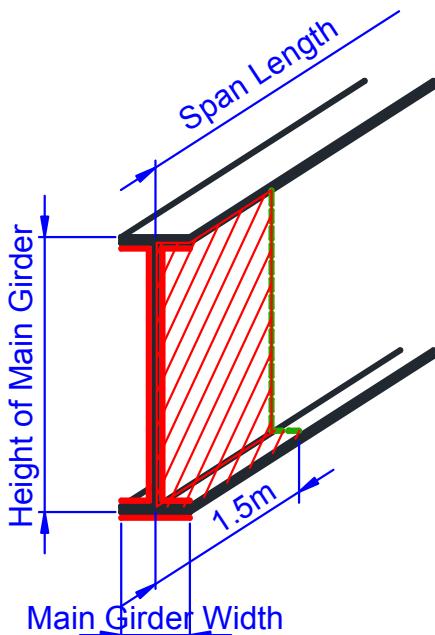
e.g.2 Supplementing Steel Plate of Steel I-Girder

- Damage of Corrosion Dt Area to cover (m²)
- → 1.5m x 2 side = 3.0m

3.0 x ← coefficient

$$(MG\ Width\ x2 + Height\ of\ MG\ x2)$$

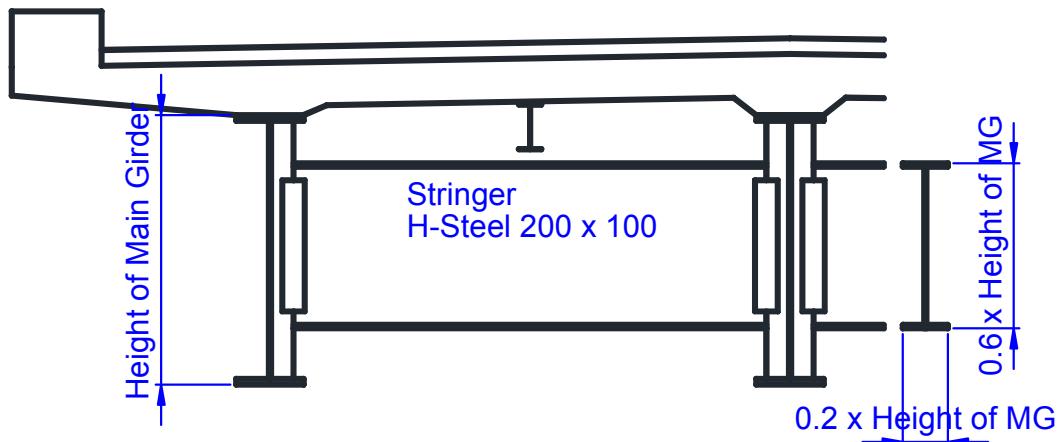
: Basic Formula 209



e.g.3 In case of Steel Cross Beam or Stringer

Area to be remedied of steel cross beam or steel stringer is calculated based on following rule.

- Cross beam : Supposing as Full-web cross beam
- Stringer : Supposing as Fixed size steel



e.g.4 Crack Filling of Concrete Girder

- Damage of Crack Ct
- Length of crack (m)
- Crack occurs every 0.5m.
0.5m is border value of
“crack spacing is large or small”

$$(Width + Height/2x2) \times Span/0.5m$$

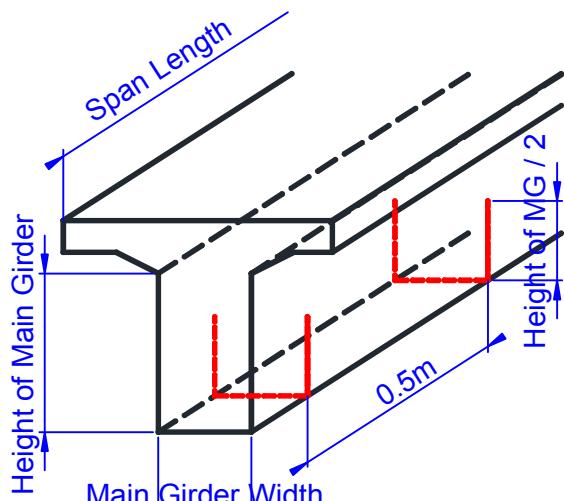
→

2.0 x

← coefficient

$$(MG\ Width \times 1 + Height\ of\ MG \times 1) \times Span\ Length$$

: Basic Formula 205



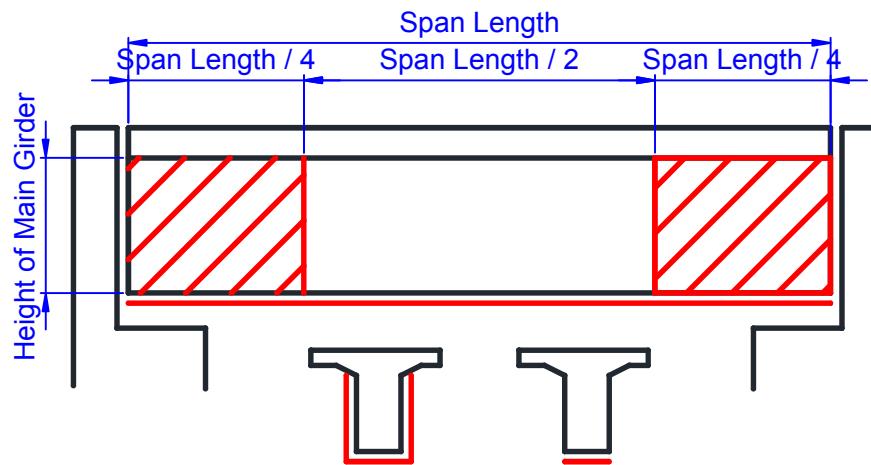
e.g.5 CFS Bonding of Concrete Girder

- Damage of Crack Dt
- Area (m²)
- Reinforcing with Carbon Fiber Sheet.

$$\text{Width} \times \text{Span} + (\text{Height} \times 2 \times \text{Span}/4) \times 2 \rightarrow 1.0 \times \quad \leftarrow \text{coefficient}$$

(MG Width x 1 + Height of MG x 1) x Span Length

: Basic Formula 205



*Red colored area is reinforced with Carbon Fiber Sheet.

e.g.6 Section Repair of Concrete Member

- Damage of Spalling Ct
- Volume (m³)
- Supposing thickness = 5cm



For Concrete Main Girder

$$0.05 \times \quad \leftarrow \text{coefficient}$$

MG Width x Span Length

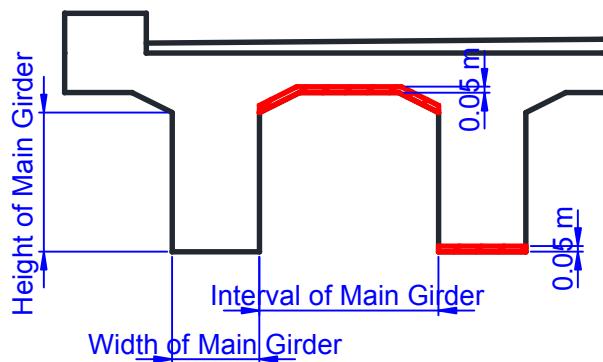
: Basic Formula 204

For Concrete Deck Slab

$$0.05 \times \quad \leftarrow \text{coefficient}$$

Interval of MG x Span Length

: Basic Formula 202



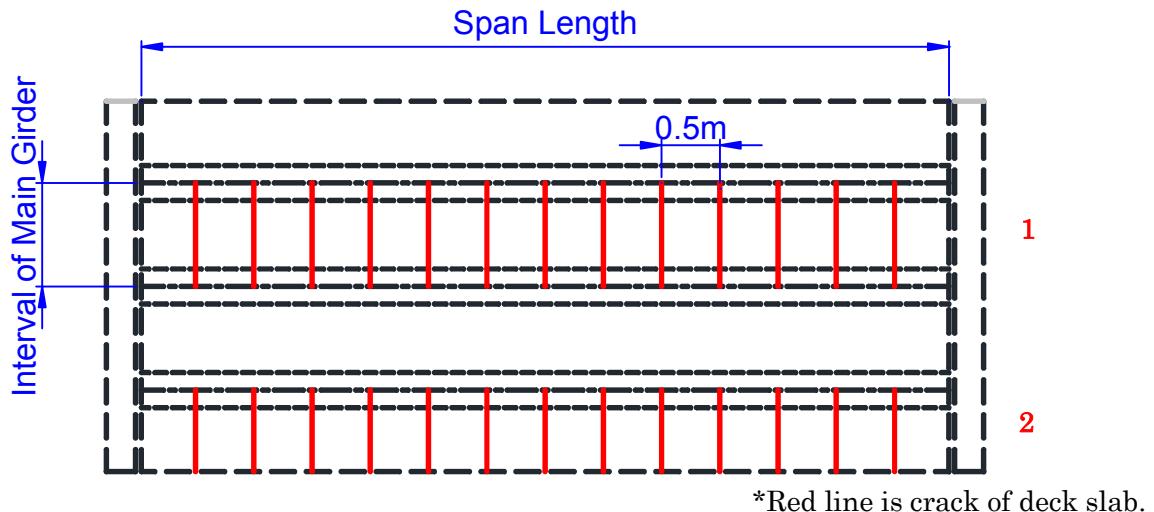
e.g.7 Crack Injection of Concrete Deck Slab

- Damage of Crack of Deck Slab Ct
- Length of crack (m)
- Crack occurs every 0.5m to one direction (Supposing)

Interval of MG x Span length / 0.5m → 1.0 x ← coefficient

Interval of MG x Span Length

: Basic Formula 202

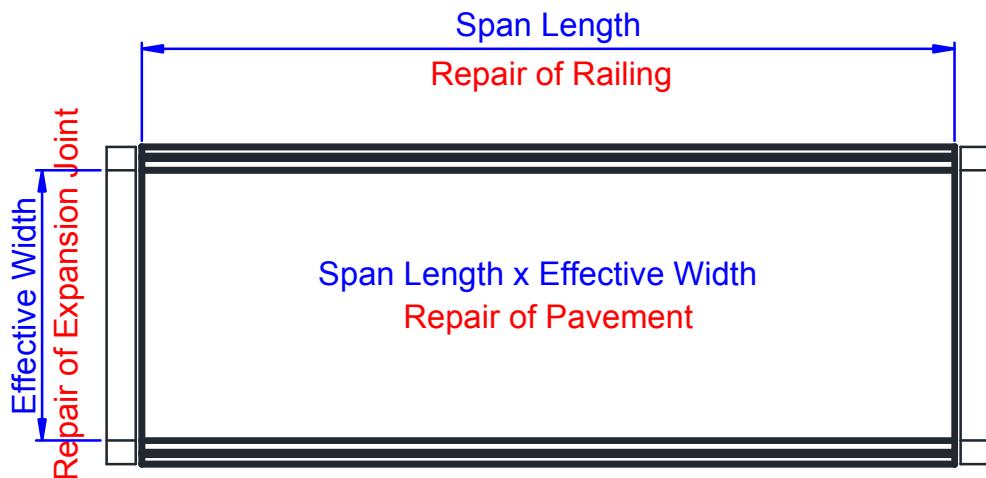


*Red line is crack of deck slab.

e.g. In case of above drawing,

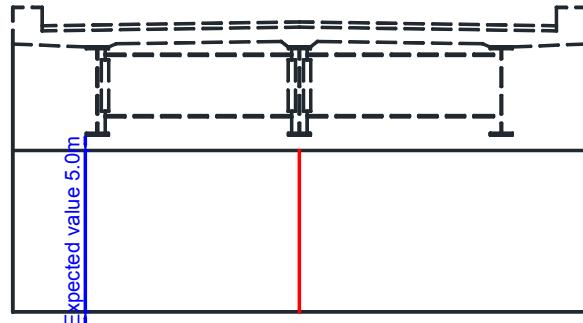
Number of element (to be remedied) in Bridge Remedial Measure is “2”.

e.g.8 Other Remedial Measure of Superstructure



e.g.9 Crack of Abutment

- Crack of Abutment Ct or Dt
- Length of crack (m)
- Large crack occurring at center of vertical wall by reason of concrete drying shrinkage of huge mass concrete. Height of vertical wall is 5.0m set as expected value.



$5.0 \times$ ← coefficient

Fix (Fix is same as 1.0) Basic Formula 101

e.g.10 Settlement/Tilt/Movement and Scouring of Footing

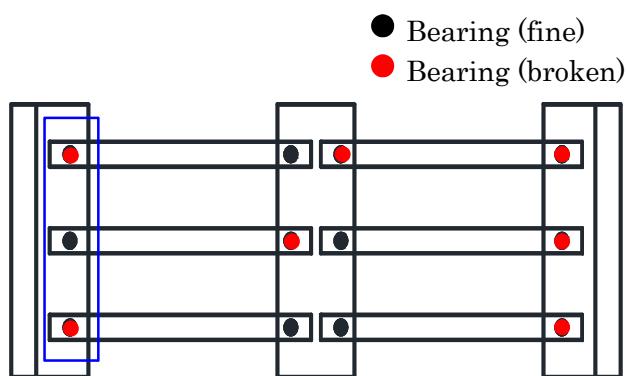
- Settlement/Tilt/Movement and Scouring of Footing Ct or Dt
- Repairing of Settlement, Repairing of Scouring
- Volume of buried work (m³)
- Volume of each footing is fixed as Width 10.0m x Length 5.0m x Depth 3.0m = 150 m³

$150 \times$ ← coefficient

Fix (Fix is same as 1.0) Basic Formula 101

e.g.11 Repaint or Replacement of Bearings

- No. of Bearings per each line
(Shape tab of Basic Data) = 3
- No. of Element (to be remedied)
(Draft of Bridge Remedial Measure)
 - 1st span = 3
 - 2nd span = 4



e.g.12 Crack of Box Culvert (Head Slab, Side Wall and Footing)

- Crack of element of Box culvert Ct or Dt
- Length of crack (m)
- Crack occurs every 0.5m. 0.5m is border value of “crack spacing is large or small”

[Crack of Head Slab]

2.0 x ← coefficient

Span Length x Width of Culvert Basic Formula 301

[Crack of Side Wall]

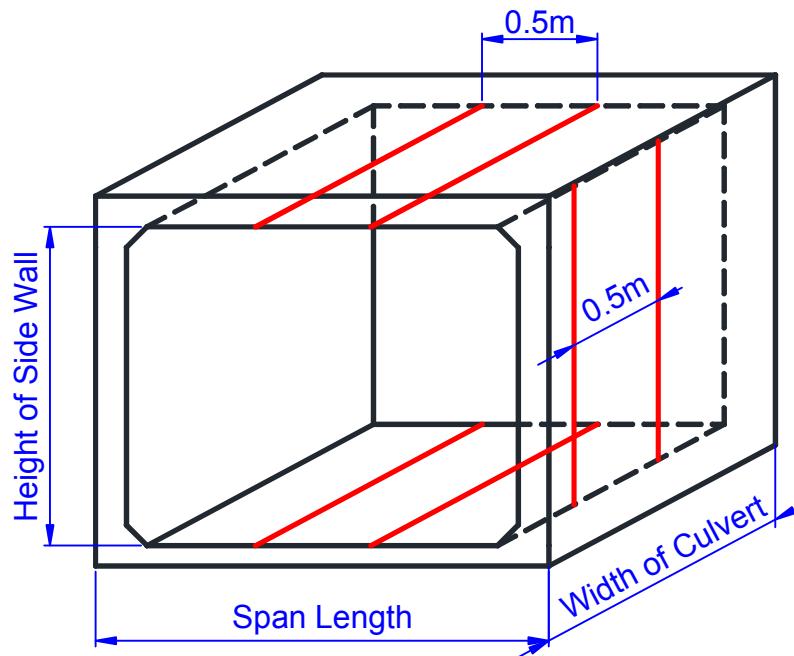
2.0 x ← coefficient

Width of Culvert x Height of Side Wall Basic Formula 303

[Crack of Footing]

2.0 x ← coefficient

Span Length x Width of Culvert Basic Formula 301



A P P E N D I X

Aug 2018

A P P E N D I X

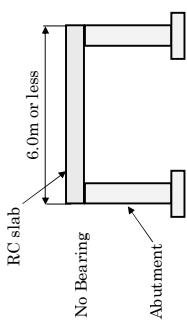
BASIC KNOWLEDGE OF BRIDGE

Bridge and Culvert Type

<Concrete Bridge >

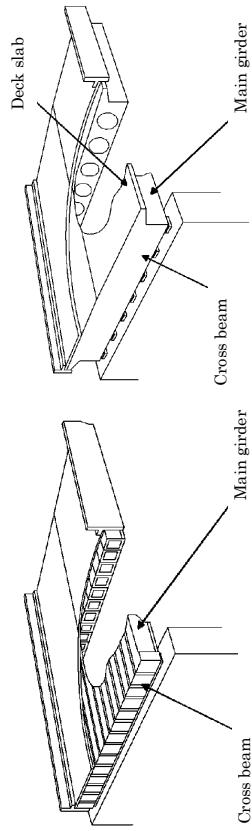
1. Small Slab Bridge (Former "Slab Culvert")

A structure comprising a slab(s) without girders supported on abutments/piers and having a length of 6.0m or less measured at right angles between the extreme vent way boundaries.



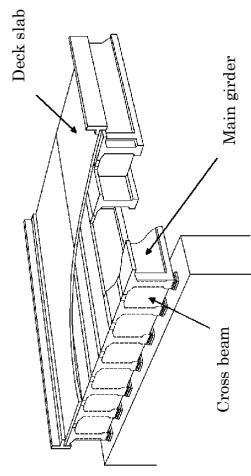
2. RC Slab Bridge

In general, the span is less than 16m

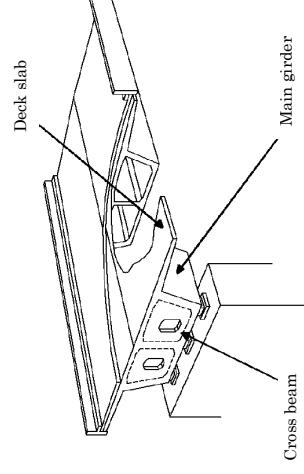


4. PC Girder Bridge

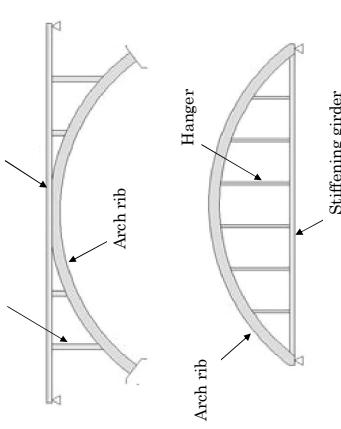
In general, the span is more than 20m



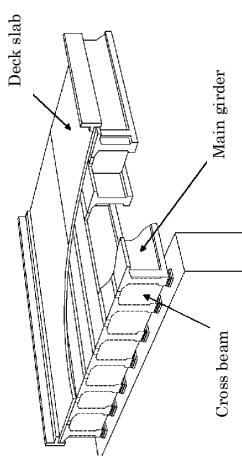
5. PC Box Girder Bridge



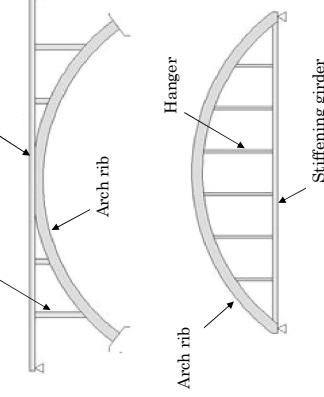
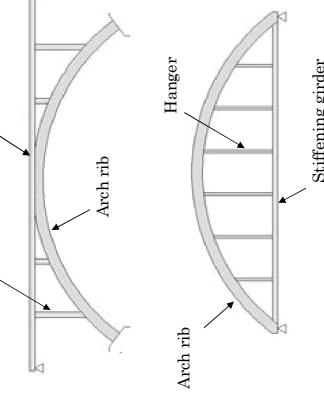
6. Concrete Arch Bridge



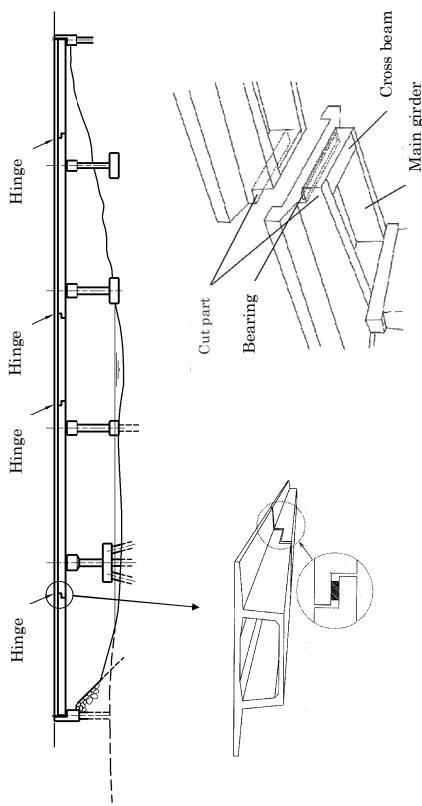
In general, the span is less than 20m. In special case It can be less than 30m



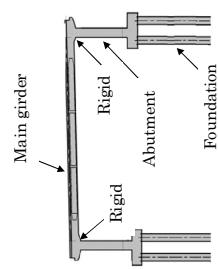
3. RC Girder Bridge



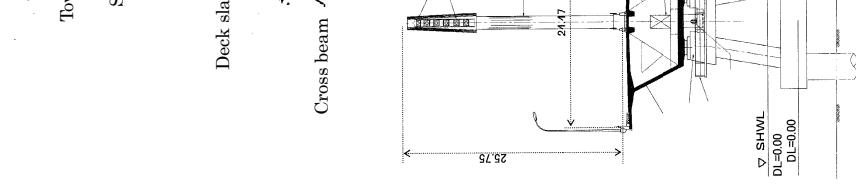
7. Cantilever Bridge with Hinge



8. Rigid Frame Bridge



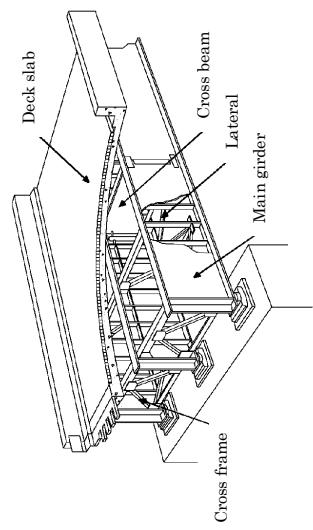
9.Cable-Stayed Bridge



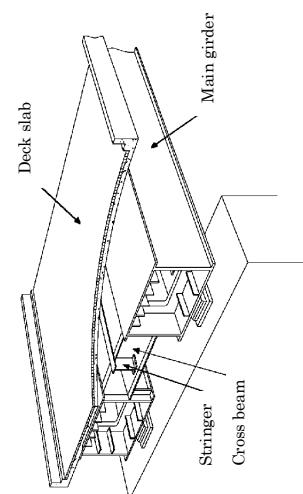
Section and elements of the 3rd Kamaphuli Bridge (Extradosed bridge)

< Steel Bridge >

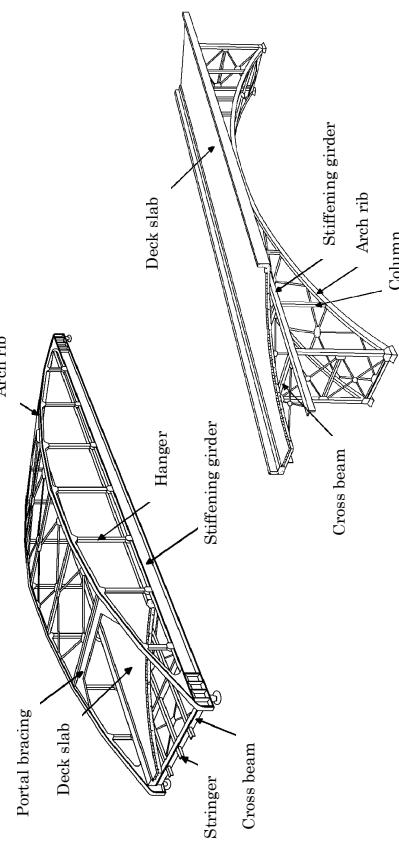
10. Steel Girder Bridge



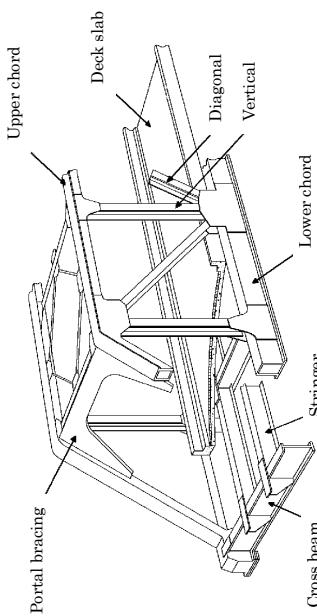
11. Steel Box Girder Bridge



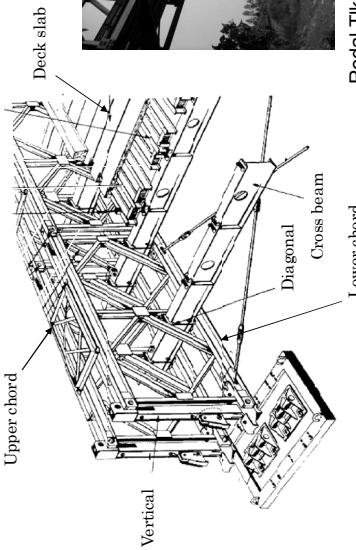
12. Steel Arch Bridge



- 13. Truss Bridge with Steel Deck**
- 14. Truss Bridge with RC slab**
- 15. Truss Bridge with Timber Deck**



- 16. Portable Steel Bridge with Steel Deck**
- 17. Portable Steel Bridge with Timber Deck**

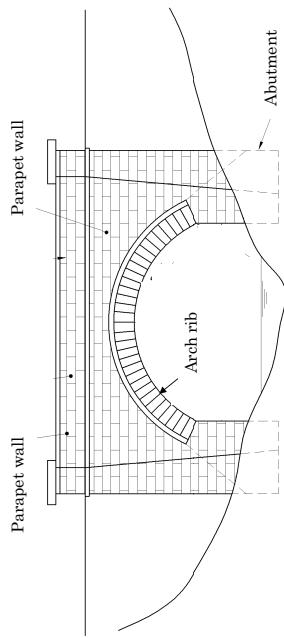


Rodal Tiki Portable Steel Bridge in Manikganj



< Masonry Arch Bridge >

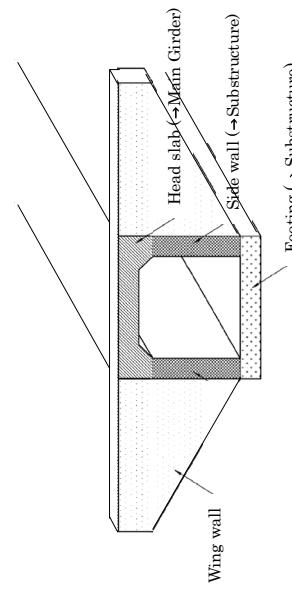
18. Masonry Arch Bridge



< Culvert >

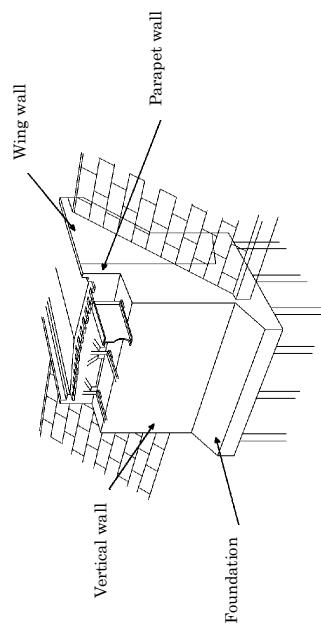
19. Box Culvert

A structure which is in a box form (single or multiple cell) in cross-section which contains a ground slab, and where the floor, walls and deck are of monolithic construction, i.e. there are no joints or bearings within the structural unit.

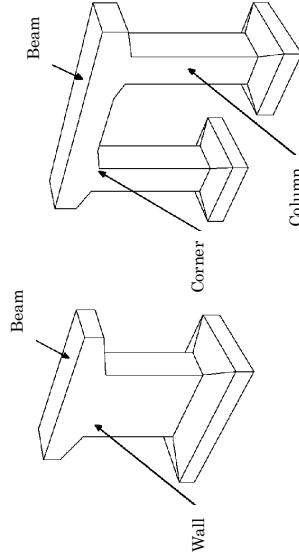
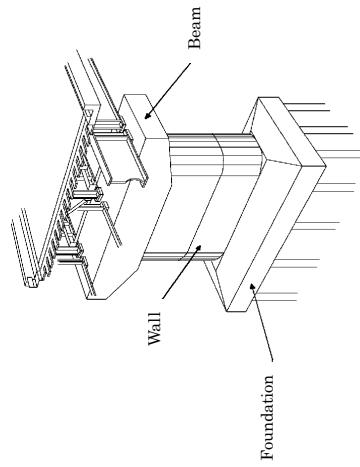


< Substructure Type >

<Abutment>

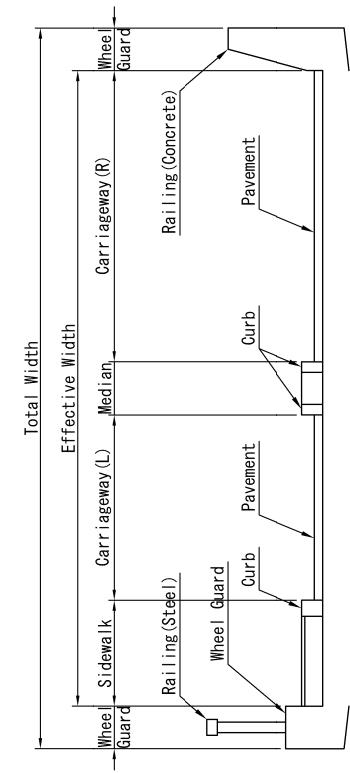
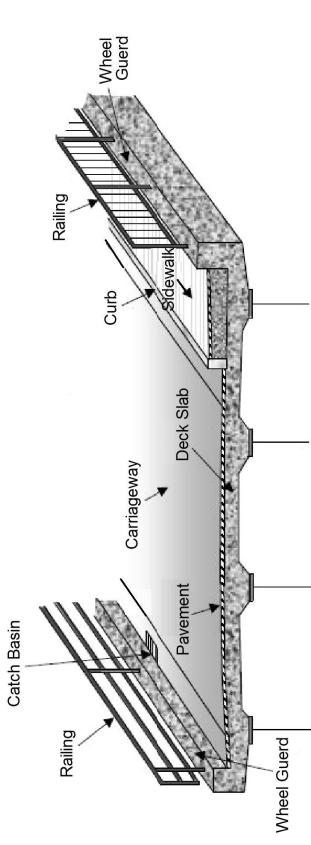
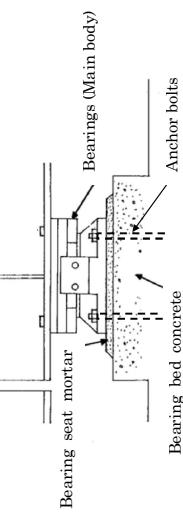


<Pier>

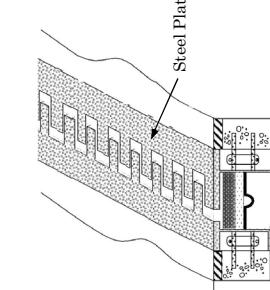
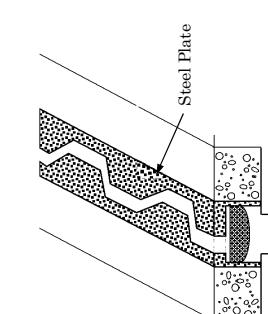
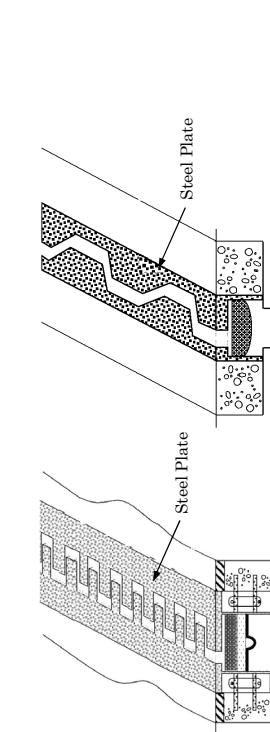


Bearings

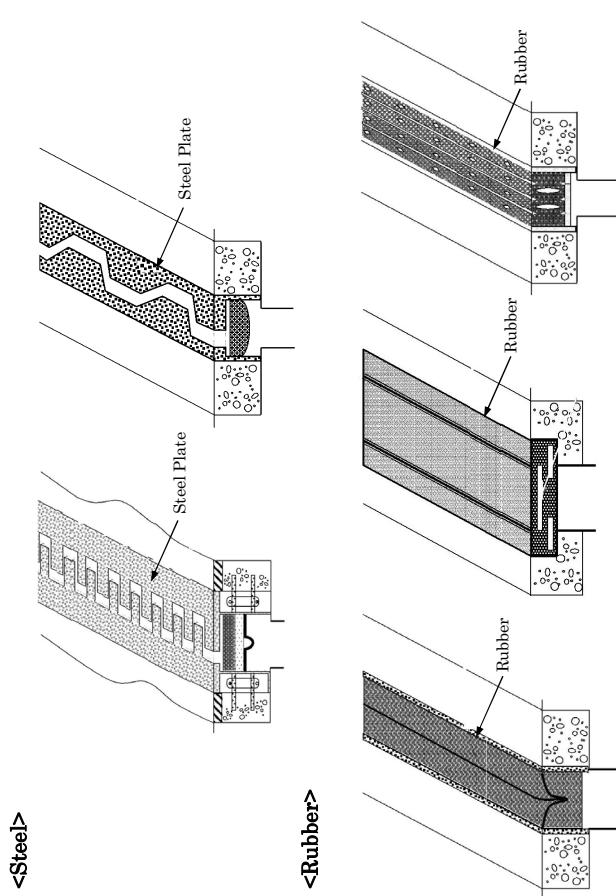
Deck Surface



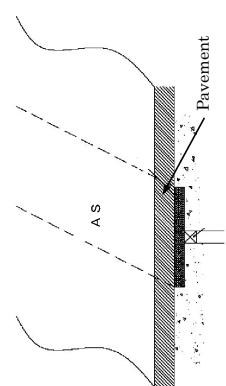
Expansion Joint



<Steel>



<Others>



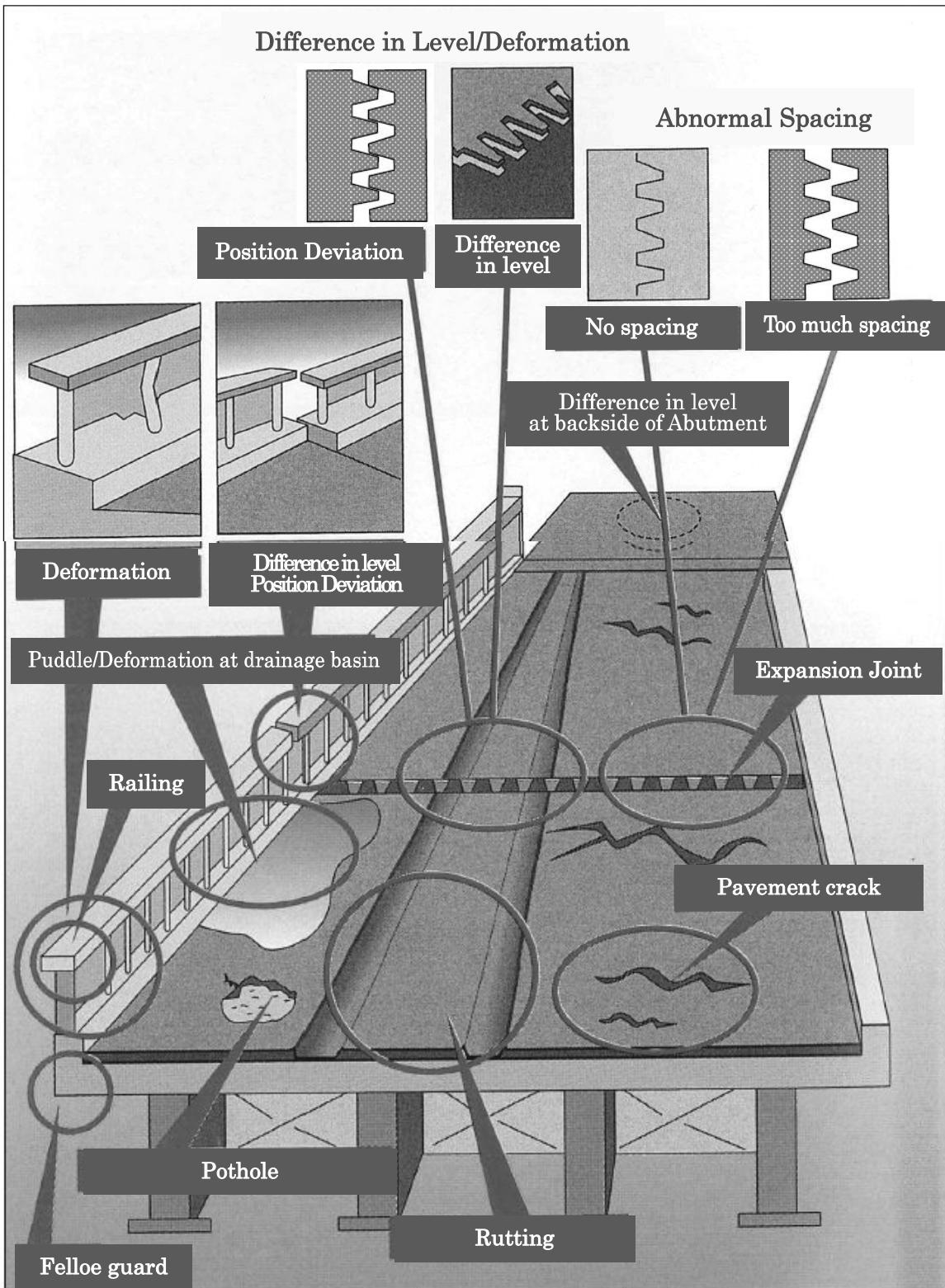


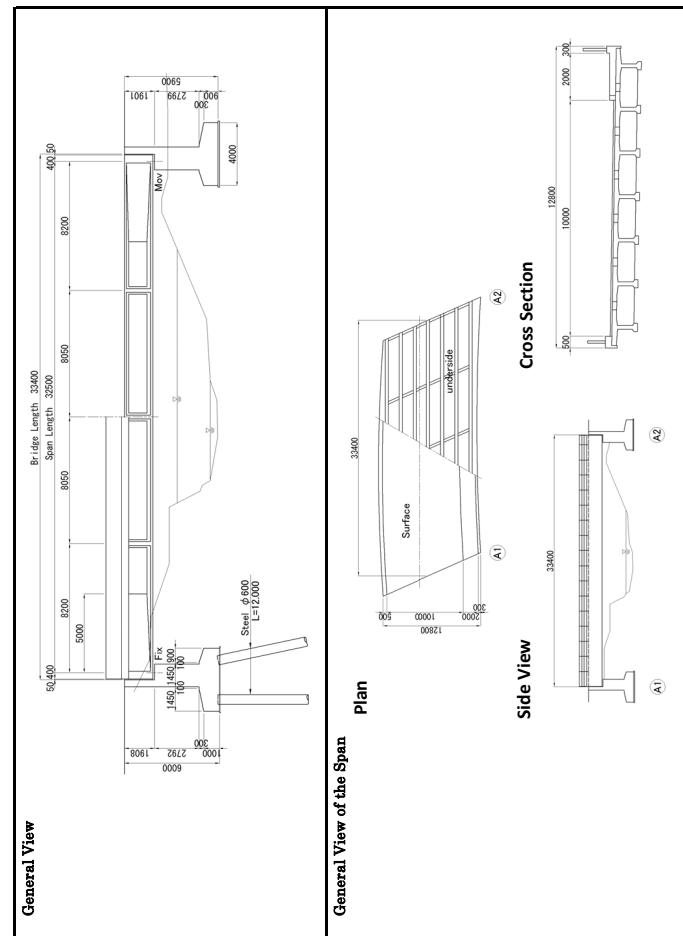
Figure Summary of Possible Defects and Locations

A P P E N D I X

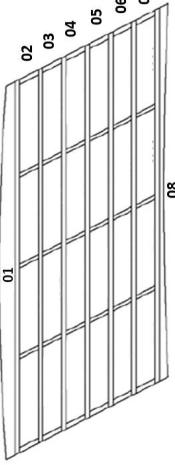
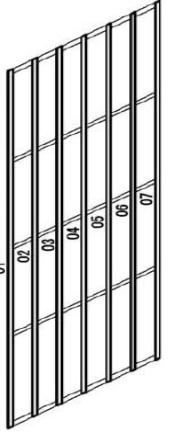
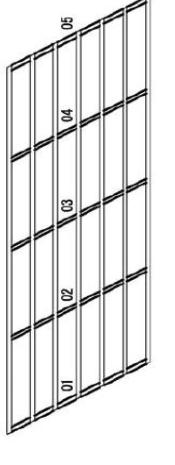
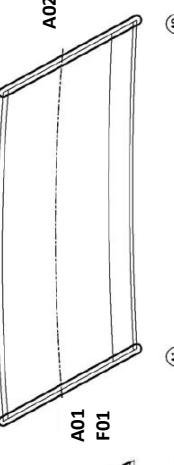
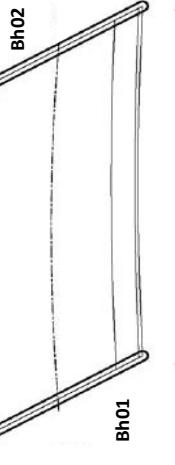
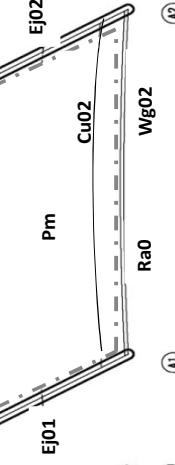
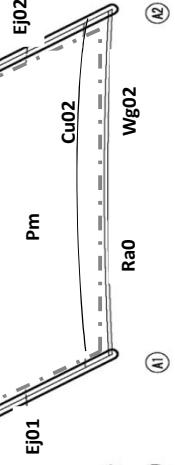
RECORDING OF INVENTORY AND RESULT

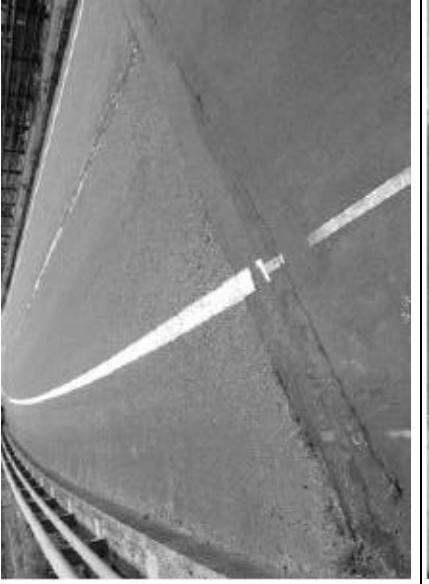
Periodic Inspection/Evaluation Report Form (Sample)

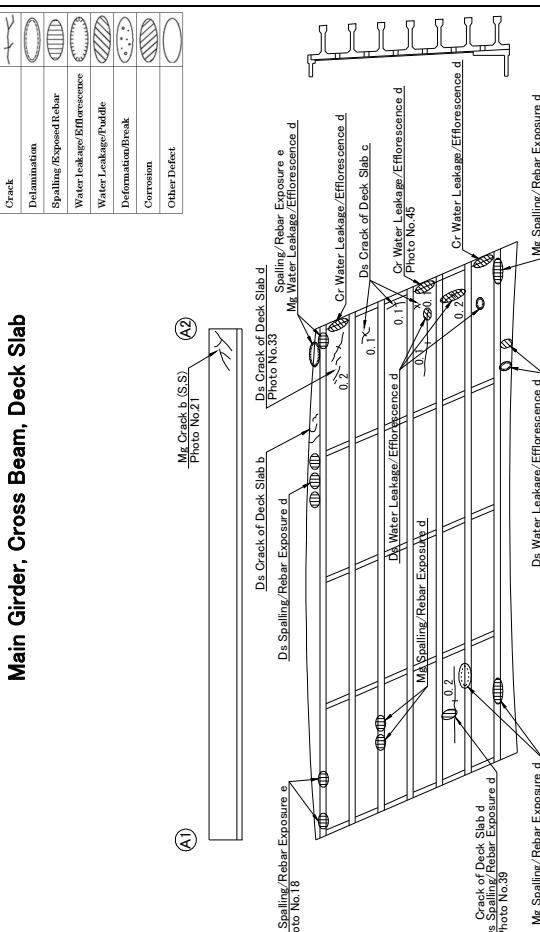
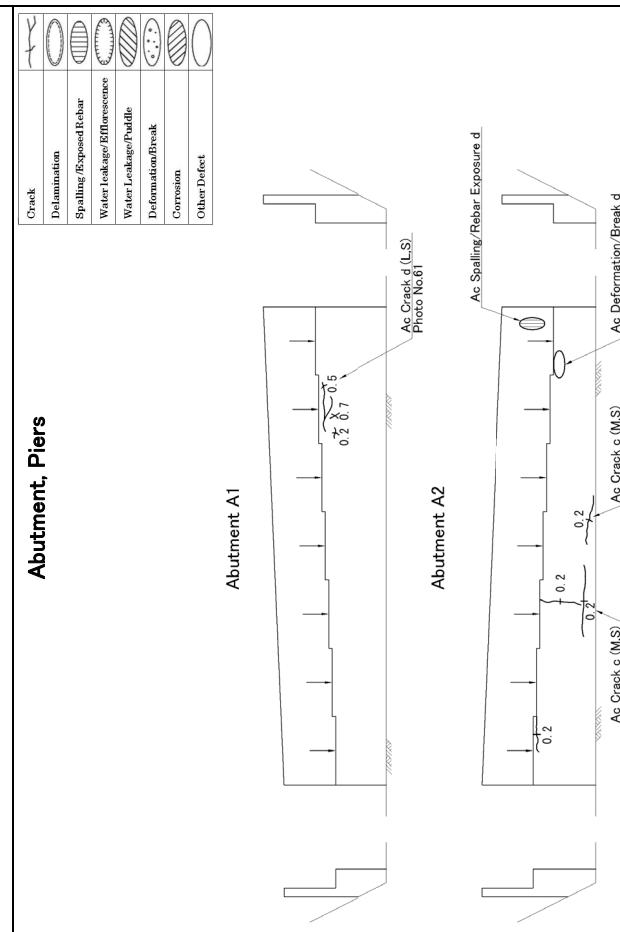
File Number		Inspector				Date								
Zone	Dhaka	Circle	Dhaka	Division	Narayanganj-1	Sub-Division Narayanganj-1								
District	Upazilla		Union		Village									
Road No.	Road Name	Dhaka(Jatrabari)-Comilla-Chittagong-Takam	I.R.P Name	I.R.P 8b	GPS Lat 23°42'7.5"	Long 90°30'57.3"								
Bridge Name	Yamato Bridge	I.R.P-Offset (m)	5+89'6	Load Restriction	Chainingage (km)	8.976								
Year of Construction	1972	Design Standard	Design Load	TL-20	Load (ton)	(ton)								
Feature Intersected	River	Owner	Owner	Public Utilities Carried	telephone line water	Owner								
	Road	Owner	Owner			Owner								
	Railway	Owner												
Bridge Length	33.4	No. of Spans	1	Span Arrangement	38.4	Skew Angle (degree)	85							
Superstructure	Type	Material	Type	Material	Type	Material	Type							
Substructure	PC Girder Br	Concrete	Deck Slab	RC	Concrete	Concrete	Concrete							
	Semi-Gravity type	Concrete	Foundation (Abutment)	Pile Foundation	Foundation (Pier)	Steel	Steel							
Other Elements	Abutment							
	Pier	Asphalt		Bearings	Rubber									
	Pavement	Expansion Joint Steel		Railing	Others									
Total Width	12.8	m	Wheel	Sidewalk L	Carriage way'L	Median	Carriage way'R	Sidewalk R	Wheel Guard'R					
Effective Width	12.0	m	0.5	m	0.0	m	4.5	m	2.0	m	0.3	m	0.0	m
Census (year)	2014				Heavy Vehicle Traffic Rate (%)				0~10~20~30~30~					
Traffic Conditions	Traffic Volume	10,500		Vehicles	Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
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		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
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		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
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		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Traffic Volume			Daytime 12 hours		Condition Category		0~10~20~30~30~					
		Census (year)			Daytime 12 hours		Condition Category		0~10~20~30~30~					



General Drawings

Element Numbering System		Bridge Number	Bridge Name	Yamato Bridge	Route Name	Span No.	1
Bridge Number							
Viewpoint	Front View						
Date							
Deck Slab (Ds)							
							
Main Girder (Mg)							
							
Cross Girder (Cr)							
							
Substructure							
Abutment (A), Foundation (F)							
							
Bearings (Bh)							
							
Railing (Ra), Wheel Guard (Wg)							
							
Expansion Joint (Ej), Curb (Cb), Pavement (Pm)							
							

Overall View Photo		Bridge Number	Bridge Name	Yamato Bridge	Route Name	Viewpoint	Front View	Date
								
								
								

Defect Sketch		Bridge Number	Bridge Name	Yamato Bridge	Route Name	Defect Photos
Main Girder, Cross Beam, Deck Slab						
						
Abutment, Piers						
						
Span No.	1	Photo No.	33	Span No.	1	Photo No.
Element	Deck Slab	Defect	Crack of Deck Slab	Element	Deck Slab	Defect
		Rating	d			Spalling/Rebar Exposure
Span No.	1	Photo No.	25	Span No.	1	Photo No.
Element	Main Girder	Defect	Spalling/Rebar Exposure	Element	Cross Beam	Defect
		Rating	d			Leakage/Efforescence
Span No.	1	Photo No.	45	Span No.	1	Photo No.
Element	Main Girder	Defect	Spalling/Rebar Exposure	Element	Deck Girder	Defect
		Rating	d			Rating

Bridge Evaluation Report Form

																Date	Evaluator		
																Year	1972		
																Sub-Division	PC Girder Bridge		
																Span No.	1		
																Page No.	1/3		
																Al No.	Minor	Major	Emergency
																B1	C1	Di	Public Safety
																Repair	Re-Paint	Detailed Investigation	Remarks

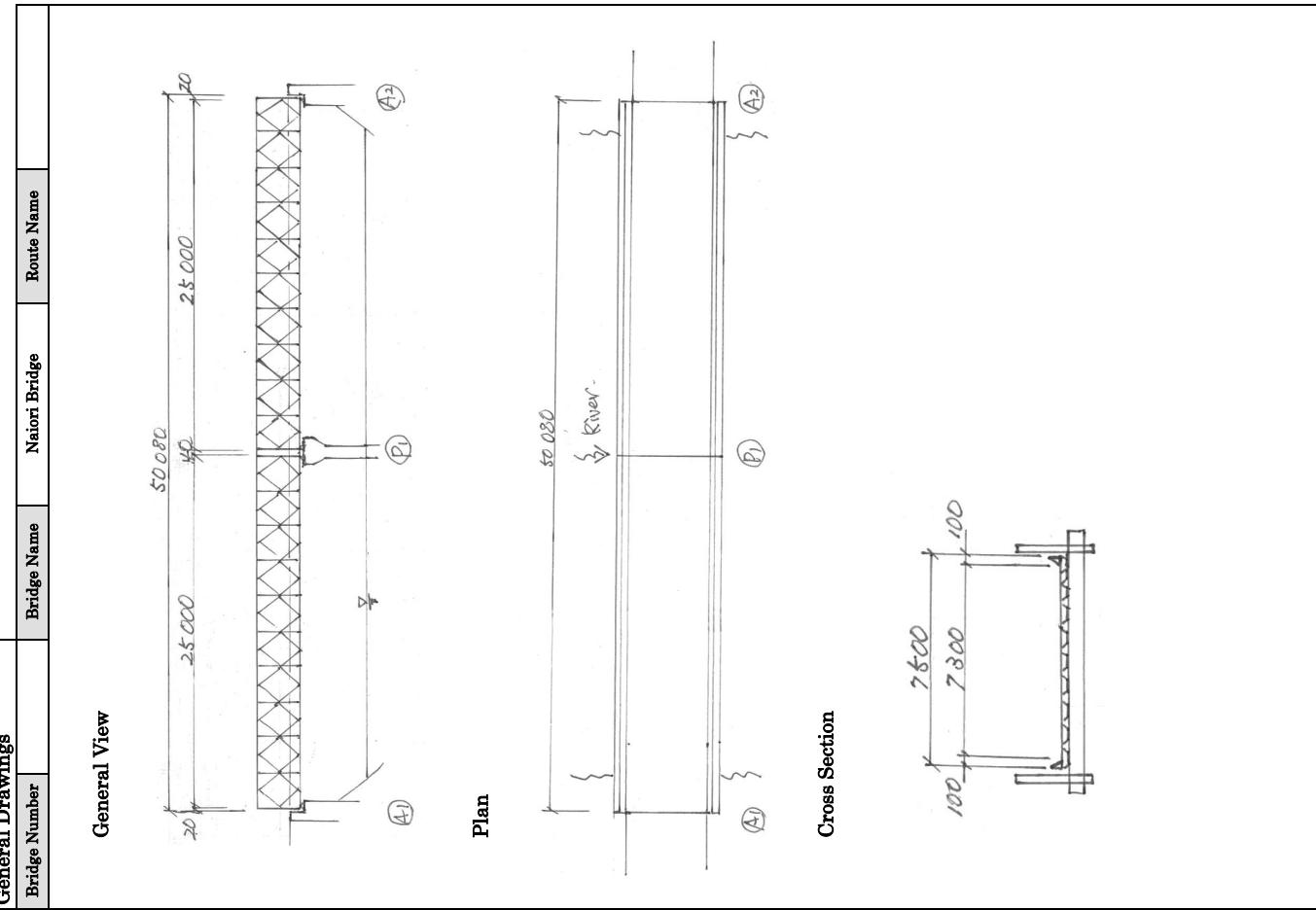
Bridge Evaluation Report Form

File Number		Bridge Name		Yamato Bridge		Superstructure		PC Girder Bridge		Bridge Name		Yamato Bridge		Sub-Division		PC Girder Bridge		Year		1972			
File Zone	Number	Zone	Circle	Circle	Division	Span No.	1	Bi	Ci	Zone	Circle	Division	Span No.	1	Bi	Ci	Di	Minor	Major	Emergency	Public Safety	Detailed Investigation	
Evaluation Result		Evaluator																		Date			
Evaluation Result																						Page No. 3/3	
Component	Element Type	Material	Type of Defects	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair	Public Safety	Repair	Detailed Investigation	Element Type	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair
Abutment Pier Side Wall Parapet Wall	* Primary element	Steel	1.Corrosion	Steel	2.Crack in Steel	Pavement	Common	Bi	Cl	Di	Others	Others	13.Difference in Level	Element Type	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair	
			3.Loose or Missing Bolts		4.Fracture																		
			5.Deterioration of Paint System		6.Crack																		
			7.Spalling / Exposed Rebar		8.Water leakage / Efflorescence																		
			9.Delamination		10.Others																		
			11.Delamination		12.Others																		
			13.Defects of Reinforcing material		14.Defects of Paint System																		
			15.Function Disorder of Bearings		16.Others																		
			17.Defects of Reinforcing material		18.Water leakage / Efflorescence																		
			19.Discoloration / Deterioration		20.Water Leakage / Puddle																		
Substructure Foundation Eroding Foiling Retaining Wall	* Primary element	Steel	21.Abnormal Noise / Vibration	Concrete	22.Deflection / Break	Common	Common	Bi	Cl	Di	Others	Others	13.Difference in Level	Element Type	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair	
			23.Deflection / Tilt / Movement		24.Deflection / Tilt / Movement																		
			25.Settlement / Tilt / Movement		26.Scour																		
			27.Settlement / Tilt / Movement		28.Corrision																		
			29.Crack in Steel		30.Corrision																		
			31.Loose or Missing Bolts		32.Corrision																		
			33.Fracture		34.Corrision																		
			35.Deterioration of Paint System		36.Corrision																		
			37.Corrision		38.Corrision																		
			39.Corrision		40.Corrision																		
Bearings	* Primary element	Steel	41.Corrision	Steel	42.Corrision	Common	Common	Bi	Cl	Di	Others	Others	13.Difference in Level	Element Type	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair	
			43.Corrision		44.Corrision																		
			45.Corrision		46.Corrision																		
			47.Corrision		48.Corrision																		
			49.Corrision		50.Corrision																		
			51.Corrision		52.Corrision																		
			53.Corrision		54.Corrision																		
			55.Corrision		56.Corrision																		
			57.Corrision		58.Corrision																		
			59.Corrision		60.Corrision																		
Bearing Main Body Anchor Bolts	* Primary element	Steel	61.Corrision	Concrete	62.Corrision	Common	Common	Bi	Cl	Di	Others	Others	13.Difference in Level	Element Type	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair	
			63.Corrision		64.Corrision																		
			65.Corrision		66.Corrision																		
			67.Corrision		68.Corrision																		
Bearings	* Primary element	Steel	69.Corrision	Concrete	70.Corrision	Common	Common	Bi	Cl	Di	Others	Others	13.Difference in Level	Element Type	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair	
			71.Corrision		72.Corrision																		
			73.Corrision		74.Corrision																		
			75.Corrision		76.Corrision																		
Bearing Seat Mortal Bearing Bed concrete	* Primary element	Steel	77.Corrision	Concrete	78.Corrision	Common	Common	Bi	Cl	Di	Others	Others	13.Difference in Level	Element Type	Material	Type of Defects	Al	No	Minor	Major	Emergency	Repair	
			79.Corrision		80.Corrision																		
			81.Corrision		82.Corrision																		
			83.Corrision		84.Corrision																		
Inspection Facility Utility Pipe	* Primary element	Steel	85.Corrision	Concrete	86.Corrision	Common	Common	Bi	Cl	Di	Others	Others	13.Difference in Level	Element Type	Material								

Periodic Inspection/Evaluation Report Form (Sample)

File Number	Inspector			Date	Division	Sub-Division	Strajganj
Zone	Erajbabi	Circle	Pabna				Strajganj-1
District		Upazilla		Union		Village	
Road No.	R451	Road Name	Nalka Strajganj Road	LRP Name	LRP001	GPS Lat	24d-26'47"
Bridge Name	Naori Bridge	LRP+Offset (m)		Long		Long	86d-36'4"
Year of Construction	1980	Design Standard	Design Load	Chainage (km)	0.907	(km)	
Feature Intersected	River	Owner	Public Utilities Carried	Load Restriction		(ton)	
Road	Owner	telephone line					Owner
Railway	Owner	water					Owner
Bridge Length	50.08	No. of Spans	2	Span Arrangement	26+25	Shew Angle (degree)	90
Superstructure	Portable Steel Bridge with Steel Deck	Type	Material	Type		Material	
Abutment	Inverted T-type	Concrete	Steel	Deck Slab	Steel	Steel	
Substructure	Pier	Concrete		Foundation (Abutment)	Piled		...
	Wall Type	Concrete		Foundation (Pier)	Piled		...
Other Elements	Pavement	None	Bearings	Steel			
	Expansion Joint	None	Railing	None			
Width Effective Width	7.50 m	Wheel Guard-L	Sidewalk-L	Carriage way-L	Median	Carriage way-R	Wheel Guard-R
Traffic Conditions	6.05 m	0.1 m	0.0 m	7.80 m	m	0.0 m	0.1 m
	Census (year)					0~10	20~30~30~
	Traffic Volume		Vehicles (Daytime 12 hours) for Entire Bridge	Condition Category	35	B	

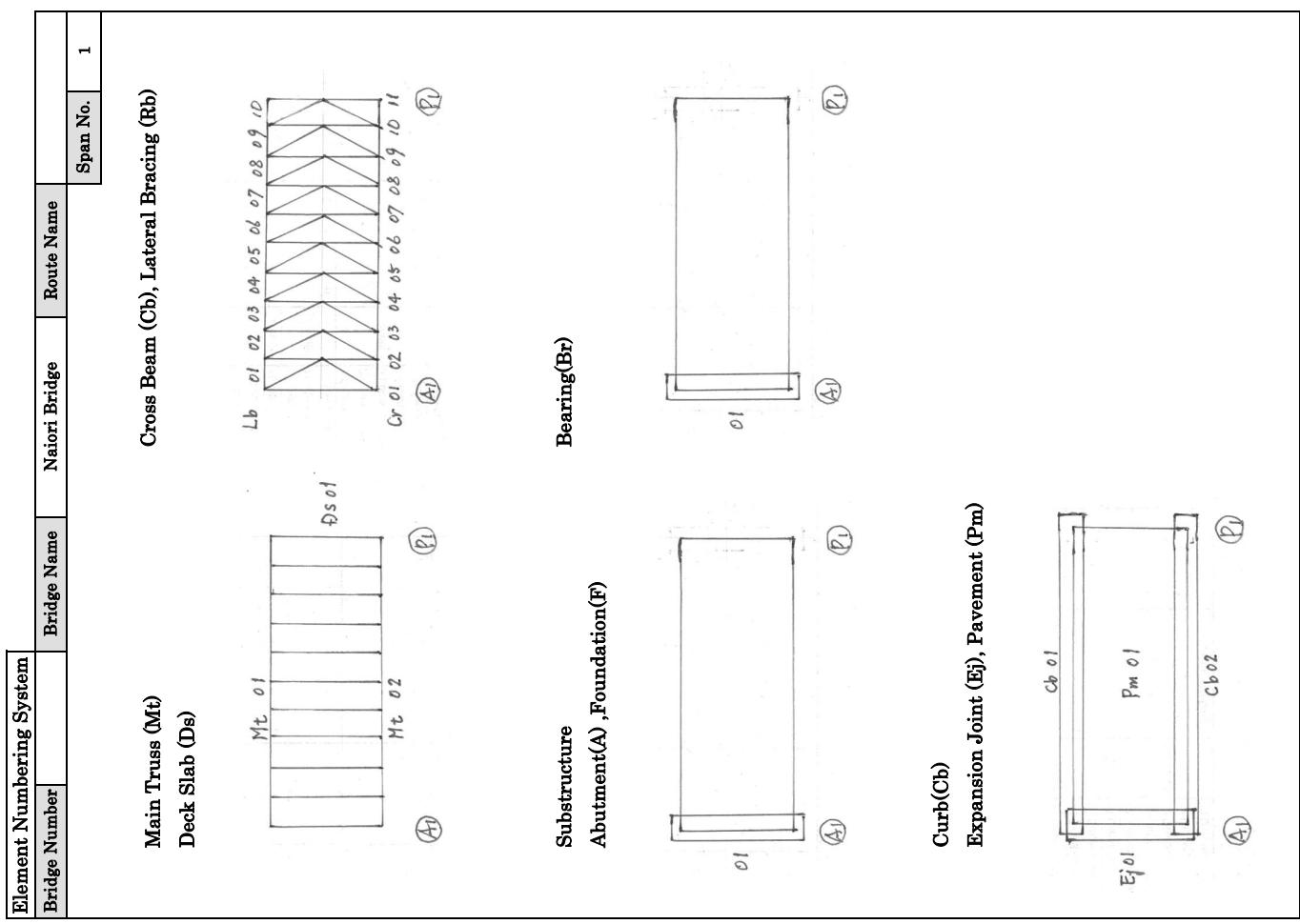
General Drawings		Bridge Number		Bridge Name		Naori Bridge		Route Name	
		A1		A2		A3		A4	
General View									



Overall View Photo			
Bridge Number	Bridge Name	Naiori Bridge	Route Name
Viewpoint Date	Front View 23.08.15	Side View	



Element Numbering System			
Bridge Number	Bridge Name	Naori Bridge	Route Name
Viewpoint Date	Front View 23.08.15	Side View	



Defect Sketch		Bridge Number	Bridge Name	Route Name

Bearing Photo No. 3
Accumulation of debris e

Expansion Joint
Difference in level C
Photo No. 4

Deck Slab C Break C Photo No. 2

Deck Slab Corrosion C Photo No. 1

Element Numbering System	Bridge Number	Bridge Name	Naori Bridge	Route Name	Span No.	2
Main Truss (Mt)						
Deck Slab (Ds)						

Cross Beam (Cb), Lateral Bracing (Rb)

Lb 01 02 03 04 05 06 07 08 09 10
Or 01 02 03 04 05 06 07 08 09 10 11

(P1) (A2)

Substructure

Abutment(A), Pier(P), Foundation(F)

(P1) (A2)

Bearing(Br)

(P1) (A2)

Curb(Cb)

Expansion Joint (Ej), Pavement (Pm)

Ej 01 Pm 01 Cb 01
Ej 02 Cb 02
(P1) (A2)

Periodic Inspection Report Form

File Number		Bridge Name		Superstructure PBS with Steel Deck		Year		1980																					
Zone	Rajshahi	Circle	Patna	Division	Streetsaj	Sub-Division	Streetsaj-1	Span No.	1																				
Survey Result																													
Corrosion	Steel Material	Concrete Material	Others	No. of Hinge	0	Span Length	25.0	Span No.	1																				
Crack	Crack	Crack of Deck Slab	Deflection	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Crack	Crack	Crack of Deck Slab	Deflection	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Deterioration of Paint System	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26			
Spalling/Exposed Rebar	Spalling/Exposed Rebar	Spalling/Exposed Rebar	Spalling/Exposed Rebar	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Water Leakage/Frostscreeme	Water Leakage/Frostscreeme	Water Leakage/Frostscreeme	Water Leakage/Frostscreeme	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Abnormal Spalling	Abnormal Spalling	Abnormal Spalling	Abnormal Spalling	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Abnormal Anchorage	Abnormal Anchorage	Abnormal Anchorage	Abnormal Anchorage	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Discoloration/Decoloration	Discoloration/Decoloration	Discoloration/Decoloration	Discoloration/Decoloration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Water Leakage/Water Leak	Water Leakage/Water Leak	Water Leakage/Water Leak	Water Leakage/Water Leak	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Defects of Reinforced Materials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26			
Other	Other	Other	Other	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Remarks	Remarks	Remarks	Remarks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Bridge Evaluation Report Form**Bridge Evaluation Report Form**

File Number		Bridge Name		Naioti Bridge		Superstructure		PSB with Steel Deck		Date	KONISHI, Toshiyuki	Evaluator	KONISHI, Toshiyuki		Date	23.08.15		
Zone	Rajshahi	Circle	Pabna	Division	Sirajganj	Sub-Division	Year	1980	1	23	1980	PSB with Steel Deck	Superstructure	PSB with Steel Deck	Year	Srirajganj	Sub-Division	Srirajganj-1
Evaluation Result		Evaluation Result												Span No.		Page No.		
Component	Element Type	Material	Type of Defects	Al	Bl	Ci	Dl	Public Safety	Detailed investigation	AI	Bi	Ci	Dl	Major	Minor	Emergency Repair	Detailed Safety Investigation	
Main Girder	Steel	1.Corrosion 2.Crack in Steel 3.Loose or Missing Bolts 4.Fracture	v	v	v	v	v			1.Corrosion 2.Crack in Steel 3.Loose or Missing Bolts 4.Fracture	Steel							
Main Truss	Concrete	5.Deterioration of Paint System 6.Crack 7.Spalling / Exposed Rebar 8.Water leakage / Efflorescence	v	v	v	v	v			5.Deterioration of Paint System 6.Crack 7.Spalling / Exposed Rebar 8.Water leakage / Efflorescence	Concrete							
Main Arch	Others	11.Delamination 12.Abnormal Spacing 16.Other Types of Defects	v	v	v	v	v			11.Delamination 16.Other Types of Defects	Others							
Outer Cable	Arch Rib	17.Defects of Reinforcing material 18.Abnormal Anchorage	v	v	v	v	v			17.Defects of Reinforcing material 18.Abnormal Anchorage	Concrete							
Main Tower	Common	19.Discoloration / Deterioration 20.Water Leakage / Puddle 21.Abnormal Noise / Vibration	v	v	v	v	v			19.Discoloration / Deterioration 20.Water Leakage / Puddle 21.Abnormal Noise / Vibration	Common							
Arch Rib	Top Slab	22.Abnormal Deflection 23.Deformation / Break	v	v	v	v	v			22.Abnormal Deflection 23.Deformation / Break	* Primary element							
Top Slab		24.Corrosion 25.Settlement / Tilt / Movement	v	v	v	v	v			24.Corrosion 25.Settlement / Tilt / Movement	Steel							
		26.Scouring	v	v	v	v	v			26.Scouring	Steel							
		27.Crack	v	v	v	v	v			27.Crack	Concrete							
		28.Water leakage / Efflorescence	v	v	v	v	v			28.Water leakage / Efflorescence	Concrete							
		29.Delamination	v	v	v	v	v			29.Delamination	Others							
		30.Other Types of Defects	v	v	v	v	v			30.Other Types of Defects	Others							
		31.Defects of Reinforcing material	v	v	v	v	v			31.Defects of Reinforcing material	Concrete							
		32.Abnormal Anchorage	v	v	v	v	v			32.Abnormal Anchorage	Concrete							
		33.Discoloration / Deterioration	v	v	v	v	v			33.Discoloration / Deterioration	Common							
		34.Abnormal Noise / Vibration	v	v	v	v	v			34.Abnormal Noise / Vibration	Common							
		35.Deflection	v	v	v	v	v			35.Deflection	Retaining Wall							
		36.Crack	v	v	v	v	v			36.Crack	Retaining Wall							
		37.Spalling / Exposed Rebar	v	v	v	v	v			37.Spalling / Exposed Rebar	Retaining Wall							
		38.Water leakage / Efflorescence	v	v	v	v	v			38.Water leakage / Efflorescence	Retaining Wall							
		39.Delamination	v	v	v	v	v			39.Delamination	Retaining Wall							
		40.Other Types of Defects	v	v	v	v	v			40.Other Types of Defects	Retaining Wall							
		41.Defects of Reinforcing material	v	v	v	v	v			41.Defects of Reinforcing material	Retaining Wall							
		42.Abnormal Anchorage	v	v	v	v	v			42.Abnormal Anchorage	Retaining Wall							
		43.Discoloration / Deterioration	v	v	v	v	v			43.Discoloration / Deterioration	Retaining Wall							
		44.Abnormal Noise / Vibration	v	v	v	v	v			44.Abnormal Noise / Vibration	Retaining Wall							
		45.Deflection	v	v	v	v	v			45.Deflection	Retaining Wall							
		46.Crack	v	v	v	v	v			46.Crack	Retaining Wall							
		47.Spalling / Exposed Rebar	v	v	v	v	v			47.Spalling / Exposed Rebar	Retaining Wall							
		48.Water leakage / Efflorescence	v	v	v	v	v			48.Water leakage / Efflorescence	Retaining Wall							
		49.Fallen out of Deck Slab	v	v	v	v	v			49.Fallen out of Deck Slab	Retaining Wall							
		50.Deflection	v	v	v	v	v			50.Deflection	Retaining Wall							
		51.Crack	v	v	v	v	v			51.Crack	Retaining Wall							
		52.Delamination	v	v	v	v	v			52.Delamination	Retaining Wall							
		53.Other Types of Defects	v	v	v	v	v			53.Other Types of Defects	Retaining Wall							
		54.Defects of Reinforcing material	v	v	v	v	v			54.Defects of Reinforcing material	Retaining Wall							
		55.Abnormal Anchorage	v	v	v	v	v			55.Abnormal Anchorage	Retaining Wall							
		56.Discoloration / Deterioration	v	v	v	v	v			56.Discoloration / Deterioration	Retaining Wall							
		57.Abnormal Noise / Vibration	v	v	v	v	v			57.Abnormal Noise / Vibration	Retaining Wall							
		58.Deflection	v	v	v	v	v			58.Deflection	Retaining Wall							
		59.Crack	v	v	v	v	v			59.Crack	Retaining Wall							
		60.Delamination	v	v	v	v	v			60.Delamination	Retaining Wall							
		61.Other Types of Defects	v	v	v	v	v			61.Other Types of Defects	Retaining Wall							
		62.Defects of Reinforcing material	v	v	v	v	v			62.Defects of Reinforcing material	Retaining Wall							
		63.Abnormal Anchorage	v	v	v	v	v			63.Abnormal Anchorage	Retaining Wall							
		64.Discoloration / Deterioration	v	v	v	v	v			64.Discoloration / Deterioration	Retaining Wall							
		65.Abnormal Noise / Vibration	v	v	v	v	v			65.Abnormal Noise / Vibration	Retaining Wall							
		66.Deflection	v	v	v	v	v			66.Deflection	Retaining Wall							
		67.Crack	v	v	v	v	v			67.Crack	Retaining Wall							
		68.Delamination	v	v	v	v	v			68.Delamination	Retaining Wall							
		69.Other Types of Defects	v	v	v	v	v			69.Other Types of Defects	Retaining Wall							
		70.Defects of Reinforcing material	v	v	v	v	v			70.Defects of Reinforcing material	Retaining Wall							
		71.Abnormal Anchorage	v	v	v	v	v			71.Abnormal Anchorage	Retaining Wall							
		72.Discoloration / Deterioration	v	v	v	v	v			72.Discoloration / Deterioration	Retaining Wall							
		73.Abnormal Noise / Vibration	v	v	v	v	v			73.Abnormal Noise / Vibration	Retaining Wall							
		74.Deflection	v	v	v	v	v			74.Deflection	Retaining Wall							
		75.Crack	v	v	v	v	v			75.Crack	Retaining Wall							
		76.Spatial Misalignment	v	v	v	v	v			76.Spatial Misalignment	Retaining Wall							
		77.Deflection	v	v	v	v	v			77.Deflection	Retaining Wall							
		78.Crack	v	v	v	v	v			78.Crack	Retaining Wall							
		79.Delamination	v	v	v	v	v			79.Delamination	Retaining Wall							
		80.Other Types of Defects	v	v	v	v	v			80.Other Types of Defects	Retaining Wall							
		81.Defects of Reinforcing material	v	v	v	v	v			81.Defects of Reinforcing material	Retaining Wall							
		82.Abnormal Anchorage	v	v	v	v	v			82.Abnormal Anchorage	Retaining Wall							
		83.Discoloration / Deterioration	v	v	v	v	v			83.Discoloration / Deterioration	Retaining Wall							
		84.Abnormal Noise / Vibration	v	v	v	v	v			84.Abnormal Noise / Vibration	Retaining Wall							
		85.Deflection	v	v	v	v	v			85.Deflection	Retaining Wall							
		86.Crack	v	v	v	v	v			86.Crack	Retaining Wall							
		87.Delamination	v	v	v	v	v			87.Delamination	Retaining Wall							
		88.Other Types of Defects	v	v	v	v	v			88.Other Types of Defects	Retaining Wall							
		89.Defects of Reinforcing material	v	v	v	v	v			89.Defects of Reinforcing material	Retaining Wall							
		90.Abnormal Anchorage	v	v	v	v	v			90.Abnormal Anchorage	Retaining Wall							
		91.Discoloration / Deterioration	v	v	v	v	v			91.Discoloration / Deterioration	Retaining Wall							
		92.Abnormal Noise / Vibration	v	v	v	v	v			92.Abnormal Noise / Vibration	Retaining Wall							
		93.Deflection	v	v	v	v	v			93.Deflection	Retaining Wall							
		94.Crack	v	v	v	v	v			94.Crack	Retaining Wall							
		95.Delamination	v	v	v	v	v			95.Delamination	Retaining Wall							
		96.Other Types of Defects	v	v	v	v	v			96.Other Types of Defects	Retaining Wall							
		97.Defects of Reinforcing material	v	v	v	v	v			97.Defects of Reinforcing material	Retaining Wall							
		98.Abnormal Anchorage	v	v	v	v	v			98.Abnormal Anchorage	Retaining Wall							
		99.Discoloration / Deterioration	v	v	v	v	v			99.Discoloration / Deterioration	Retaining Wall							
		100.Abnormal Noise / Vibration	v	v	v	v	v			100.Abnormal Noise / Vibration	Retaining Wall							
		101.Deflection	v	v	v	v	v			101.Deflection	Retaining Wall							
		102.Crack	v	v	v	v	v			102.Crack	Retaining Wall							
		103.Delamination	v	v	v	v	v			103.Delamination	Retaining Wall							
		104.Other Types of Defects	v	v	v	v	v			104.Other Types of Defects	Retaining Wall							
		105.Defects of Reinforcing material	v	v	v	v	v			105.Defects of Reinforcing material	Retaining Wall							
		106.Abnormal Anchorage	v	v	v	v	v			106.Abnormal Anchorage	Retaining Wall							
		107.Discoloration / Deterioration	v	v	v	v	v			107.Discoloration / Deterioration	Retaining Wall							
		108.Abnormal Noise / Vibration	v	v	v	v	v			108.Abnormal Noise / Vibration	Retaining Wall							
		109.Deflection	v	v	v	v	v			109.Deflection	Retaining Wall							
		110.Crack	v	v	v	v	v			110.Crack	Retaining Wall							
		111.Delamination	v	v	v	v	v			111.Delamination	Retaining Wall							
		112.Other Types of Defects	v	v	v	v	v			112.Other Types of Defects	Retaining Wall							
		113.Defects of Reinforcing material	v	v	v	v	v			113.Defects of Reinforcing material	Retaining Wall							

Bridge Evaluation Report Form

File Number	Bridge Name	Naor Bridge	Superstructure	KONISHI, Toshiyuki	Date
Zone	Rajshahi	Circle	Pabna	FSB with Steel Deck	Year
Evaluation Result			Division	Sriaganj	Sriaganj-1
Element Type	Material	Type of Defects	A1 No Repair	B1 C1 D1	Public Safety Repair / Emergency Repair / Investigation
			Minor	Major	Detailed Remarks
Pavement	Others	13.Difference in Level 14.Abnormal Bituminous Pavement 16.Other Types of Defects			3/3
- Secondary element	Common	24.Accumulation of Debris			
Bridge Approaches	Others	14.Abnormal Bituminous Pavement 16.Other Types of Defects			
- Secondary element	Common	24.Accumulation of Debris			
Expansion Joints (Rubber / Steel)	Steel (Rubber)	13.Difference in Level 3.Loose or Missing Bolts 4.Fracture			
> Including - elements of post-cast concrete	Concrete	5.Deterioration of Paint System 6.Crack <			
- Secondary element	Concrete	11.Delamination 12.Abnormal Spacing	✓		
Railing (Steel / Concrete)	Others	13.Difference in Level 16.Other Types of Defects	✓		
> Including - Guard Fence - Median - Curb	Common	20.Water Leakage / Puddle 21.Abnormal Noise / Vibration 23.Deformation / Break			
- Secondary element	Common	24.Accumulation of Debris			
Drainage System	Steel	1.Corrosion 2.Crack in Steel 3.Loose or Missing Bolts 4.Fracture			
> Including - Catch-Basin - Drainage Pipe	Concrete	5.Deterioration of Paint System 6.Crack < 7.Spalling / Exposed Rebar 8.Water Leakage / Effluvience			
- Secondary element	Others	11.Delamination 16.Other Types of Defects			
Lighting Facility	Common	19.Discoloration / Deterioration 23.Deformation / Break			
Road Sign Facility	Steel	10.Corrosion 11.Crack in Steel 12.Crack in Polyvinyl 13.Loose or Missing Bolts 14.Fracture			
Inspection Facility	Others	19.Discoloration / Deterioration 20.Water Leakage / Puddle			
Utility Pipe	Common	23.Deformation / Break			
- Secondary element	Common	19.Discoloration / Deterioration			
- Secondary element	Steel	11.Corrision 12.Crack in Steel 13.Loose or Missing Bolts 14.Fracture			
- Secondary element	Others	16.Other Types of Defects			
- Secondary element	Common	21.Abnormal Noise / Vibration 23.Deformation / Break			

Periodic Inspection/Evaluation Report Form (Sample)

File Number		Inspector				Date				
Zone	Dhaka	Circle	Dhaka	Division	Manikganj	Bridge Number	Bridge Name			
District	-	Upazilla	-	Union	-		Sreerampur Box Culvert			
Road No.	N5	Road Name	Dhaka(Mirpur)-Utholi-Paturia	LRP Name	LRP036	GPS Lat	23.91889			
Bridge Name	Sreerampur Box Culvert	LRP+Offset (m)	0.679	Chaining (km)	36.679	Long	90.12111			
Year of Construction	1998	Design Standard	-	Load	-	(ton)				
Feature Intersected	River	Owner	Public Utilities Carried	Restriction	-					
Road	Owner	Telephone line	Owner	Load	-					
Railway	Owner	Water	Owner	Restriction	-					
Bridge Length	30.500	No. of Spans	5	Span Arrangement	5.700+5.700+5.700+5.700+5.700	Shew Angle (degree)	90			
Superstructure	Box Culvert	Type	Material	Type	Material					
Substructure	Abutment	Concrete	Concrete	Deck Slab	RC	Concrete				
	Pier	Concrete	Concrete	Foundation (Abutment)	Piled	Concrete				
Other Elements	Pavement	Asphalt	Asphalt	Foundation (Pier)	Piled	Concrete				
	Expansion Joint	None		Bearings	None					
Width Effective Width	8.30 m	Wheel Guard-L	0.65 m	Sidewalk-L	7.00 m	Carriage way-L	0.65 m	Sidewalk-R	0.65 m	Wheel Guard-R
Traffic Conditions	Census (year)	Vehicles (Daytime 12 hours)		Median	0.0 m	Carriage way-R	0.0 m	Guard-R	0.0 m	Guard-L
	Traffic Volume	Condition Category	for Entire Bridge							

General Drawings											
General View						Cross Section					

General View of the Span											
PLAN						CROSS SECTION					

Element Numbering System		Bridge Number	Bridge Name	Screerampur BoxCulvert	Route Name	Span No.
Top Slab						

Route direction

Side Wall (sw), Footing (f), Retaining Wall (rw)

Top Slab: 750!

Side Wall (sw): 600!

Retaining Wall (rw): 600!

Footing (f): 600!

Base: SW05

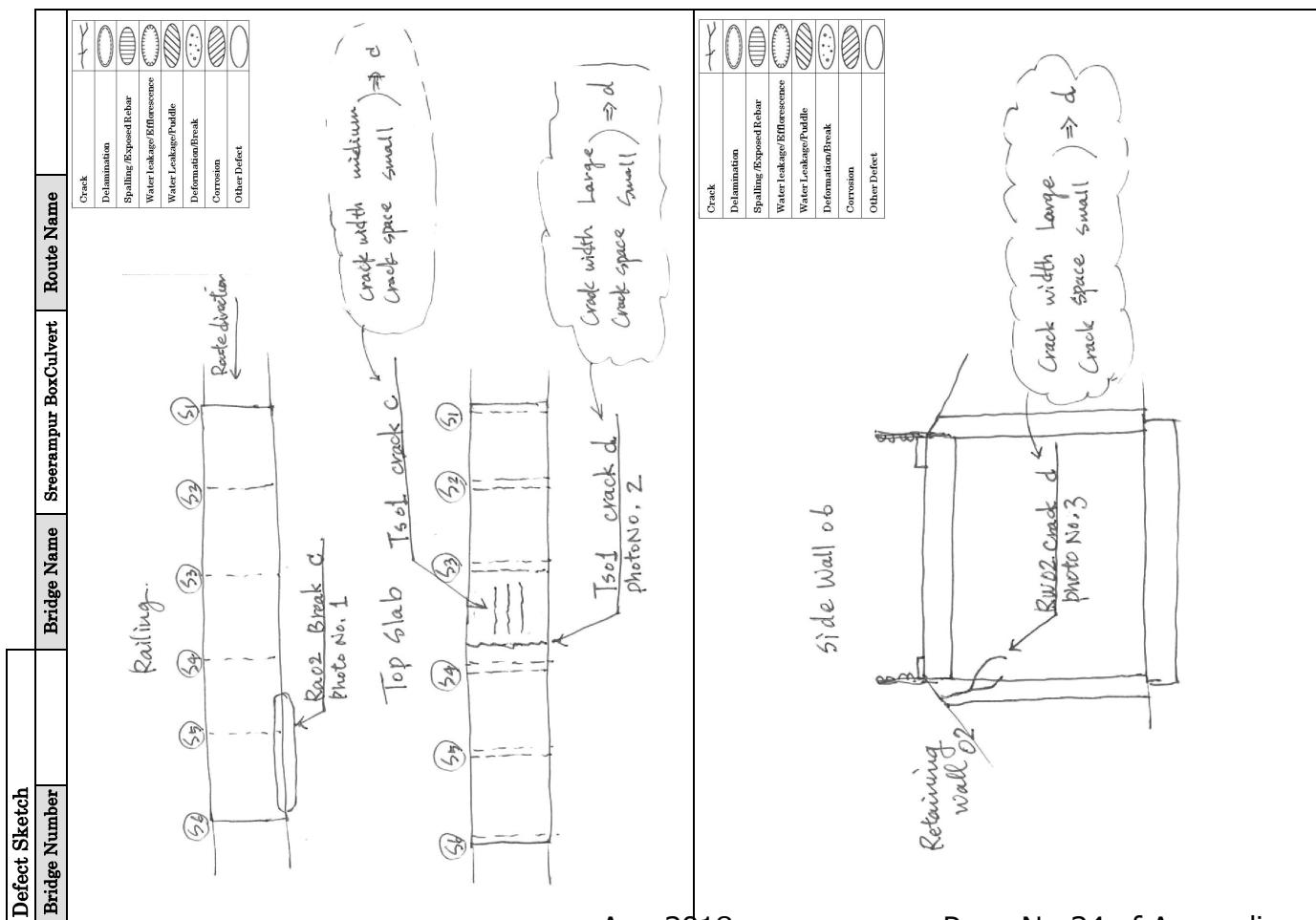
Railings (ra): Ra01, Ra02

Overall View Photo		Bridge Number	Bridge Name	Steerampur BoxCulvert	Route Name	
						Viewpoint
						Side View
Viewpoint	Front View	Date	19/07/17			
						
Viewpoint	Front View	Date	19/07/17			
Viewpoint	Under Bridge	Date	19/07/17			

Defect Photos		Bridge Name		Sreenampur BoxCulvert		Route Name	
Bridge Number		Span No.	6	Photo No.	1	Span No.	Photo No.
Element	Railing	Defect		Break	Element		Defect
		Rating	c				Rating

Span No.	3	Photo No.	2	Span No.	3	Photo No.
Element	Top Stub	Defect	Crack	Element	Top Stub	Defect
	d	Rating	d			c

Span No.	6	Photo No.	3	Span No.	3	Photo No.
Element	Retaining Wall	Defect	Crack	Element		Defect
	d	Rating	d			Rating



Part Form

Bridge Evaluation Report Form

Sample of Box Culvert

Date 19/07/17

Evaluator: Date: 19/07/17

File Number		Bridge Name		Superstructure Box Culvert		Substructure Box Culvert		Soil		Year
Survey Result	Zone	Dhaka	Circle	Dhaka	Division	Manikganj	Sub-Division	Nayabhat	Span No.	
Cross Section	Steel Material	Concrete Material	Others	No. of Hinge	0	Span Length	6.70			
Crack	Defects of Reinforced Materials									
Loose or Missing Bolts	Abnormal Biminious Pavement									
Krakture	Punctual disorder of Beams/Bridges									
Deformation of Beam	Deflection/Deterioration									
Crack	Abnormal Anchorage									
Spalling/Explored Rebar	Abnormal Spacing									
Water Leakage/Erosion	Deterioration of Deck Slab									
Parallel-out of Deck Slab	Crack of Deck Slab									
Abnormal Spacing	Abnormal Biminious Pavement									
Deformation	Difference in Level									
Others	Others									
Survey Result	Common	Division	Manikganj	Sub-Division	Nayabhat	Span No.				
Zone	Dhaka	Circle	Dhaka							
File Number	Bridge Name	Superstructure Box Culvert	Substructure Box Culvert							

Sun Rec Aug 2018

Evaluator: Date: 19/07/17

Bridge Evaluation Report Form

File Number	Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert	Sub-Division	Year	1938
Zone	Circle					Page No.	3/3
Evaluation Result		Division		Span No.			
Element Type	Material	Type of Defects		At:	Di:	Detailed Investigation	Remarks
		No Repair		Bl.	Ct.	Public Safety	
		Minor Repair				Emergency	
		Major Repair					
Pavement	Others	13.Difference in Level					
- Secondary element	Common	14. Abnormal Luminous Pavement					
Bridge Approaches	Others	16. Other Types of Defects					
- Secondary element	Common	24. Accumulation of Debris					
Expansion Joints (Rubber / Steel)	Others	13. Difference in Level					
> Including	Steel (Rubber)	14. Abnormal Luminous Pavement					
- elements of post-cast concrete	Others	16. Other Types of Defects					
Guard Rail (Concrete)	Steel	24. Accumulation of Debris					
> Including	Others	12. Abnormal Spacing					
- Guard Fence	Others	13. Difference in Level					
- Median	Steel	16. Other Types of Defects					
- Curb	Others	20. Water Leakage / Puddle					
- Secondary element	Common	21. Abnormal Noise / Vibration					
Railing (Steel / Concrete)	Steel	23. Deformation / Break					
> Including	Others	24. Accumulation of Debris					
- Guard Fence	Steel	1. Corrosion					
- Median	Steel	2. Crack in Steel					
- Curb	Steel	3. Loose or Missing Bolts					
Drainage System	Steel	4. Fracture					
> Including	Others	5. Deterioration of Paint System					
- Catch-Basin	Steel	6. Crack					
- Drainage Pipe	Steel	7. Spalling / Exposed Rebar					
- Secondary element	Concrete	8. Water Leakage / Efflorescence					
Drainage System	Steel	11. Delamination					
> Including	Others	16. Other Types of Defects					
- Catch-Basin	Steel	19. Discoloration / Deterioration					
- Drainage Pipe	Steel	23. Deformation / Break					
- Secondary element	Common	1. Corrosion					
Lighting Facility	Steel	4. Fracture					
Road Sign Facility	Steel	5. Deterioration of Paint System					
Utility Pole	Others	16. Other Types of Defects					
- Secondary element	Common	19. Discoloration / Deterioration					
Inspection Facility	Others	20. Water Leakage / Puddle					
Utility Pole	Common	23. Deformation / Break					

Sample of Box Culvert

Bridge Evaluation Report Form

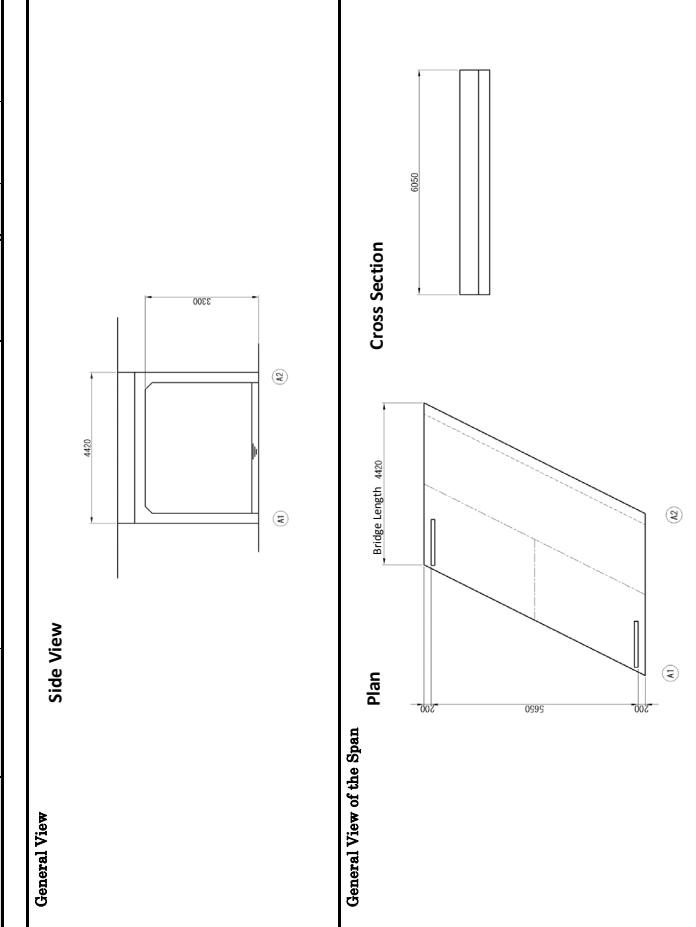
File Number	Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert	Sub-Division	Year	1938
Zone	Circle					Page No.	2/3
Evaluation Result							
Component	Element Type	Material	Type of Defects	At	Span No.	DL	Detailed Remarks
				Ef	Ct	Major Repair	Public Safety
				No	Minor Repair	Emergency	Investigation
Substructure	* Primary element	Abutment	Steel	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System			
			Concrete	6. Crack 7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 9. Delamination 10. Other Types of Defects			
			Others	11. Deflection of Reinforcing material 12. Discoloration / Deterioration 13. Water Leakage / Puddle 14. Abnormal Noise / Vibration			
			Steel	15. Deformation / Break 16. Corrosion 17. Crack in Steel 18. Deterioration of Paint System			
			Concrete	19. Spalling / Exposed Rebar 20. Water leakage / Efflorescence 21. Water Leakage / Puddle 22. Abnormal Noise / Vibration			
		Retaining Wall	Steel	23. Deformation / Break 24. Corrosion 25. Settlement / Tilt / Movement 26. Scouring			
			Concrete	27. Spalling / Exposed Rebar 28. Water leakage / Efflorescence 29. Delamination 30. Other Types of Defects			
			Others	31. Deflection of Reinforcing material 32. Discoloration / Deterioration 33. Water Leakage / Puddle 34. Abnormal Noise / Vibration			
			Common	35. Deformation / Break 36. Settlement / Tilt / Movement 37. Scour			
			Steel	38. Corrosion 39. Crack in Steel 40. Loose or Missing Bolts 41. Fracture 42. Deterioration of Paint System			
Bearings	* Primary element	Bearing Main Body	Steel (Rubber)	43. Abnormal Spacing 44. Function Disorder of Bearings 45. Delamination of Paint System			
			Others	46. Other Types of Defects 47. Water Leakage / Puddle 48. Abnormal Noise / Vibration 49. Deformation / Break 50. Accumulation of Debris			
			Common	51. Settlement / Tilt / Movement 52. Crack			
			Steel	53. Spalling / Exposed Rebar 54. Delamination 55. Other Types of Defects			
			Others	56. Water Leakage / Puddle 57. Abnormal Noise / Vibration 58. Deformation / Break 59. Accumulation of Debris			
		Anchor Bolts	Steel	60. Corrosion 61. Crack in Steel 62. Loose or Missing Bolts 63. Fracture 64. Deterioration of Paint System			
			Others	65. Function Disorder of Bearings 66. Other Types of Defects			
			Common	67. Water Leakage / Puddle 68. Abnormal Noise / Vibration 69. Deformation / Break 70. Accumulation of Debris			
			Steel	71. Settlement / Tilt / Movement 72. Crack			
			Others	73. Spalling / Exposed Rebar 74. Delamination 75. Other Types of Defects			

Periodic Inspection/Evaluation Report Form (Sample)

Sample of Box Culvert 2

File Number		N1, 8b		Inspector		Date
Zone	Dhaka	Circle	Dhaka	Division	Narayanganj-1	Sub-Division
District		Upazila		Union		Village
Road No.	N1	Road Name	Dhaka(Jatrabari)-Comilla-Chittagong-Taknaif	LRP Name	8b	GPS Lat Long
Bridge Name	Nagamachi Bridge	LRP-Offset (m)	6+9876	Chainage (km)	8.976	
Year of Construction	1988	Design Standard	Design Load	TL-20	Load Restriction	6 (ton)
Feature	River	Owner	Public Utilities Carried	telephone line water	Owner	
Intersected	Road	Owner			Owner	
Railway	Railway	Owner				
Bridge Length	4,420	No. of Spans	1 Span	Arrangement	4,420	Skew Angle (degree)
Superstructure		Type	Material		Type	Material
Abutment		Box Culvert	Concrete	Deck Slab	RC	Concrete
Substructure	Pier	---	---	Foundation (Abutment) Foundation (Pier)	---	Steel
Other Elements	Pavement	Asphalt		Bearings	None	---
	Expansion Joint	None		Railing	Steel	
Total Width	6.05 m	Wheel Guard-L	Sidewalk-L	Carriage way L	Median	Carriage way R
Effective Width	6.05 m	0.2 m	0.0 m	5.65 m	0.0 m	0.2 m
Width	Concuse (year)				Heavy Vehicle Traffic Rate (%)	0~10~10~20~20~30~30~
Traffic Conditions	Traffic Volume				Vehicles (Daytime 12 hours)	Condition Category for Entire Bridge
						35 B

The figure consists of two parts: a plan view on the left and a general view on the right. The plan view shows a trapezoidal foundation with a horizontal dimension of 200 and a vertical dimension of 100. The general view shows a bridge deck supported by piers, with a central pier labeled "Bridge Number".



Aug 2018

Page No.27 of Appendix

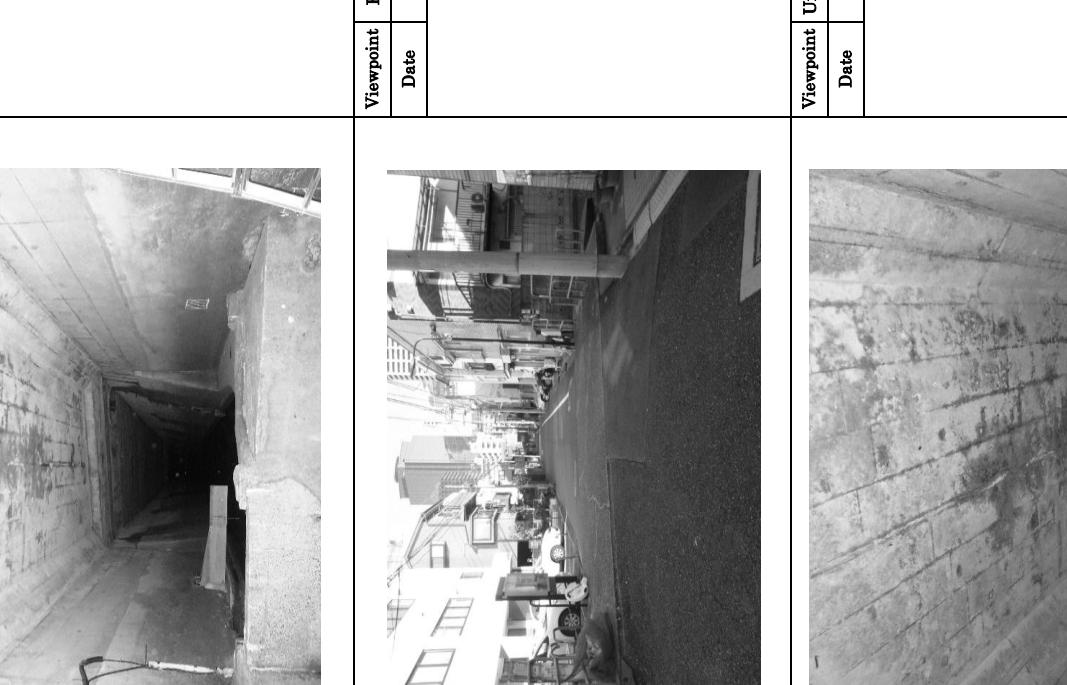
Element Numbering System		Bridge Number	Bridge Name	Nagamachi Bridge	Route Name	Span No.	1
Top Slab (T_s)							

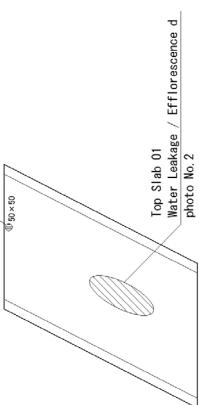
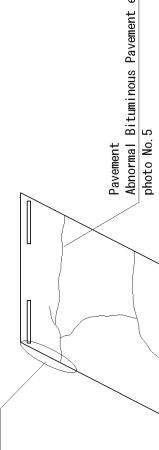
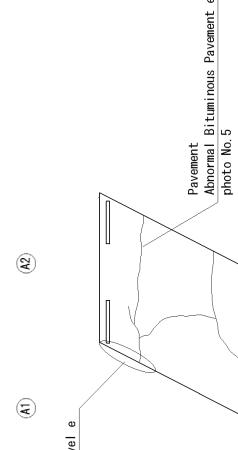
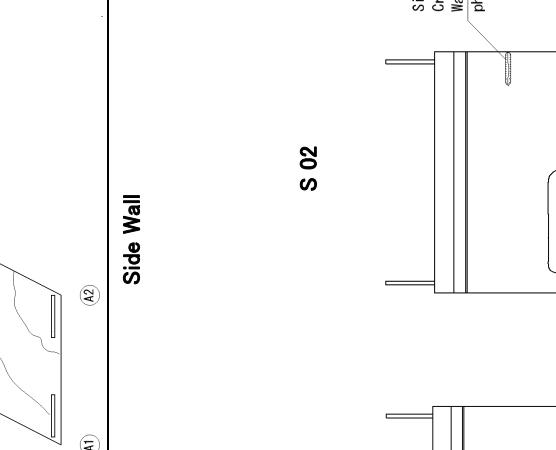
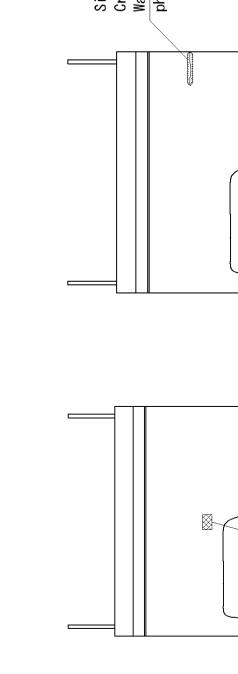
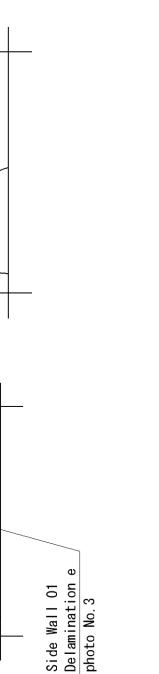
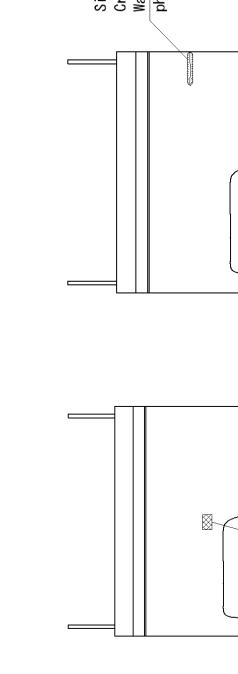
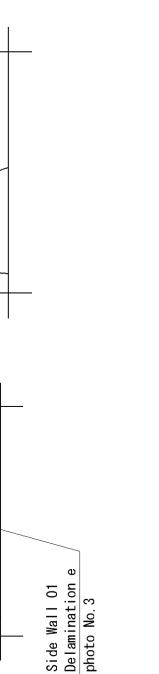
Side Wall (S), Footing (F)

(A1) (A2)

Railing (Ra), Wheel Gurad(Wg)
Expansion Joint (Ej), Pavement (Pm)

Ej 01 Ra 01 Wg U[0101] Ej 02 Ra 02 Wg (A1) (A2)

Overall View Photo				
Bridge Number	Bridge Name	Nagamachi Bridge	Route Name	
				Viewpoint
				Front View
				Date
				
				Viewpoint
				Side View
				Date
				
				Viewpoint
				Under Bridge
				Date

Defect Sketch		Bridge Number	Bridge Name	Nagamachi Bridge	Route Name
Top Slab, Pavement					
Top Slab 01 Spalling / Rebar Exposure d photo No. 1					
 					
Pavement Difference in Level e photo No. 6					
 					
S 01					
Side Wall					
Side Wall 01 Delamination e photo No. 3					
 					
S 02					
Side Wall					
Side Wall 02 Crack c Water Leakage / Efflorescence d photo No. 4					
 					

Defect Photos		Bridge Number	Bridge Name	Nagamachi Brid	Route Name
Span No.	1	Photo No.	1	Span No.	1
Element	Top Slab	Defect	Spalling/Rebar Exposure	Element	Top Slab
		Rating	d		Defect
					Rating
					e
 					
 					
 					
Span No.	1	Photo No.	1	Span No.	1
Element	Side Wall	Defect	Delamination	Element	Side Wall
		Rating	e		Defect
					Rating
					d

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Bridge Evaluation Report Form

Sample of Box Culvert 2

Bridge Evaluation Report Form**Bridge Evaluation Report Form**

File Number		Bridge Name		Nagamachi Bridge		Superstructure		Box Culvert		Year		1938	
Zone	Zone	Circle	Circle	Division	Division	Span No.	Sub-Division	Span No.	Sub-Division	Year	1938		
Evaluation Result												Date	
												Page No.	3/3
Component	Element Type	Material	Type of Defects	Al	Bl	Bi	Ci	Di	Ei	No	Minor Repair	Major Repair	Emergency Repair
Evaluation Result												Page No.	
Evaluation Result												2/3	
Evaluation Result												1	
Evaluation Result												Detailed Investigation	
Evaluation Result												Public Safety	
Evaluation Result												Emergency Repair	
Evaluation Result												Public Safety	
Evaluation Result												Detailed Investigation	
Evaluation Result												Public Safety	
Evaluation Result												Public Safety	
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Evaluation Result													

A P P E N D I X

EXCERPT

INSPECTION & EVALUATION MANUAL

1. Types of Defects and Rating

The types of defects and ratings defined in this manual are summarized as follows;

Table 1 Summary of Types of Defects and Rating

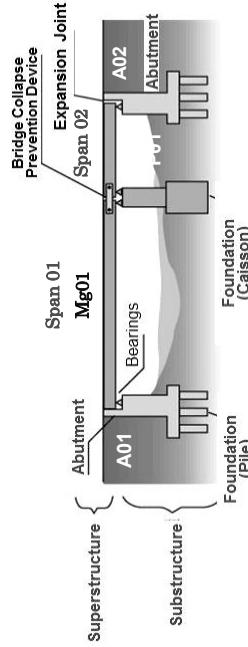
Material	No.	Faults & Defects	Rating of Defects					Remarks	
Steel									
Steel	1)	Corrosion	a	b	c	d	e	Depth & Extent	
	2)	Crack in Steel	a	-	c	-	e		
	3)	Loose or Missing Bolts	a	-	c	-	e		
	4)	Fracture	a	-	-	-	e		
	5)	Deterioration of Paint System	a	-	c	d	e	Paint, Metal Spraying, Weathering Steel	
Concrete									
Concrete	6)	Crack	a	b	c	d	e	Crack Width & Spacing	
	7)	Spalling /Exposed Rebar	a	-	c	d	e		
	8)	Water leakage/ Efflorescence	a	-	c	d	e		
	9)	Fallen out of Deck Slab	a	-	-	-	e		
	10)	Cracking of Deck Slab	a	b	c	d	e	Crack Width & Spacing	
	11)	Delamination	a	-	-	-	e		
Other Materials									
Other Materials	12)	Abnormal Spacing	a	-	c	-	e		
	13)	Difference in Level	a	-	c	-	e	T≥20mm or not	
	14)	Abnormal Bituminous Pavement	a	-	c	-	e		
	15)	Functional Disorder of Bearings	a	-	-	-	e		
	16)	Other Types of Defects	a	-	-	-	e	Illegal Occupation, Scrawl, Missing of Sealing material, Fire Damage etc.	
Common Defects									
Common	17)	Defects of Reinforcing Materials for Rehabilitation/Strengthening	a		c		e	Steel Plate, Fiber, Concrete Member, Painting	
	18)	Abnormal Anchorage	a	-	c	-	e	Anchorage of PC Tendon	
	19)	Discoloration/Deterioration of Materials	a	-	-	-	e	Concrete, Rubber, Plastics	
	20)	Water Leakage/Puddle	a	-	-	-	e		
	21)	Abnormal Noise/Vibration	a	-	-	-	e		
	22)	Abnormal Deflection	a	-	-	-	e		
	23)	Deformation/Break	a	-	c	-	e		
	24)	Accumulation of Debris	a	-	-	-	e		
	25)	Settlement/Tilt/Movement	a	-	-	-	e		
	26)	Scouring	a	-	c	-	e		

Bridge Element Numbering System

In order to standardize the reporting system and to easily interpret the inspection report, a reference system in identifying the bridge components and elements are devised. The reference systems are described below:

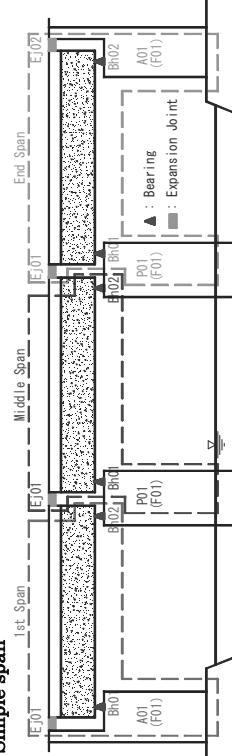
1) Superstructure

The superstructure element numbering system should include the spans, the girders, and in case of truss the panel point
The spans should be numbered consecutively, with Span 1 located at the beginning of the bridge. Multiple girders should be numbered consecutively from left to right facing in the route directions.

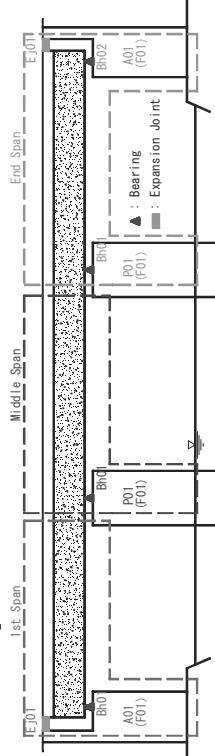


Each element of main girders and deck slab, abutment and piers, and bearings is numbered according to the following span configuration..

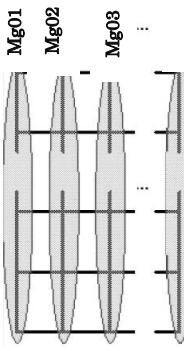
- a. Simple span



- b. Continuous span



Deck Slab



2) Substructure and Expansion joint

Substructure element numbering system should include the abutments and piers. A01 is located at the beginning of the bridge, and A02 is located at the end. The piers should be numbered consecutively, with P01 located closest to the beginning of the bridge.

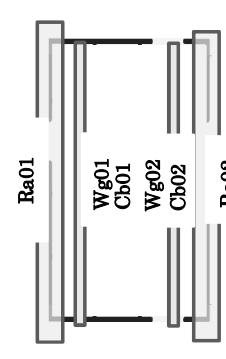
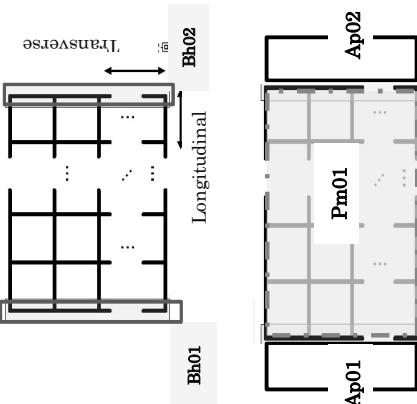
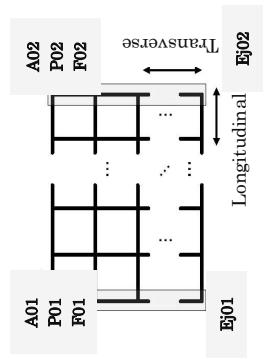
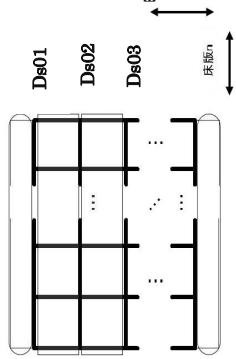
3) Bearings (Bh)

Bearings are numbered consecutively as a lined group on an abutment or a pier regardless of the number and types of bearings.

4) Pavement (Pm), Approaches (Ap)

Pavement is defined as one section in a span. Approaches are classified as that of closer to the origin and that of closer to the terminus.

- 5) Railing (Ra), Wheel Guard(Wg), Curb (Cb)
- Railing, wheel guard, curb are numbered along either left or right side line in the same way.



A P P E N D I X

EXCERPT : REHABILITATION MANUAL

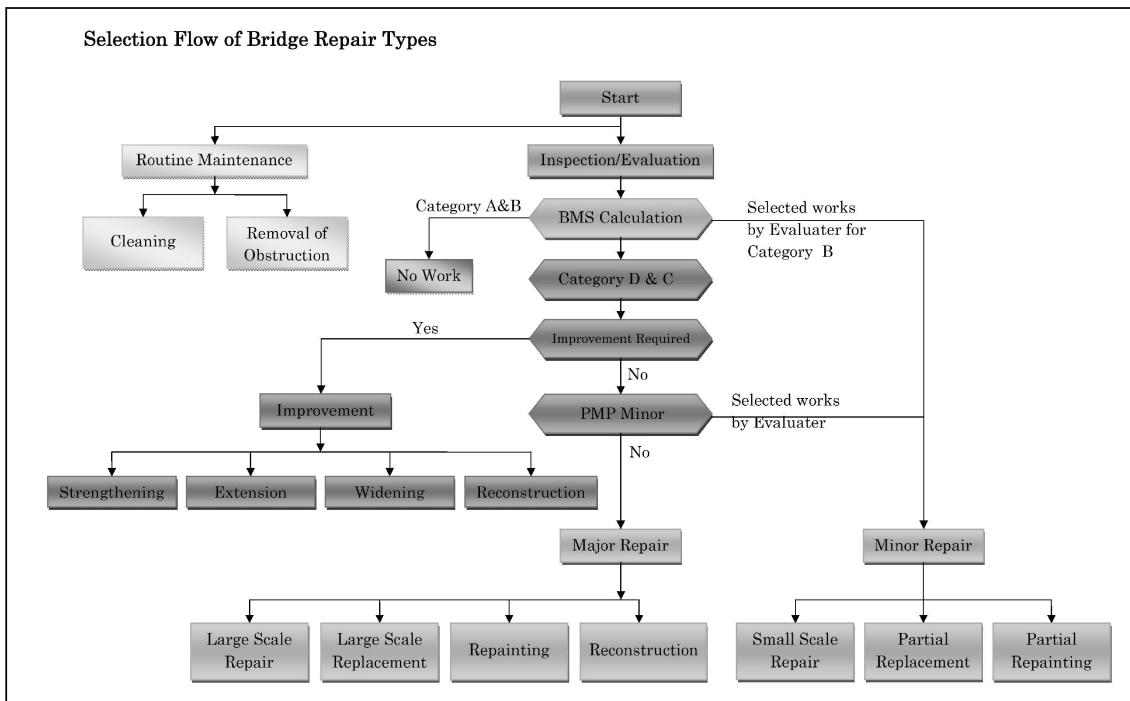


Figure 1-4 Selection Flow of Bridge repair types

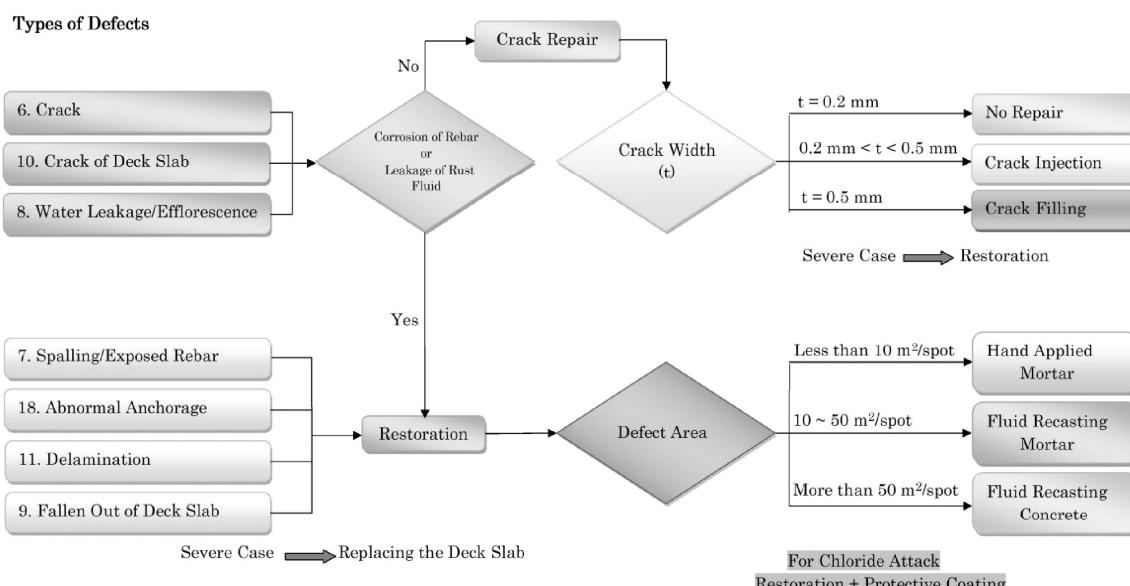


Figure 4-1 Selection Flow of Repair method of Concrete elements (Superstructure)

The Flow based by Local Government Jp

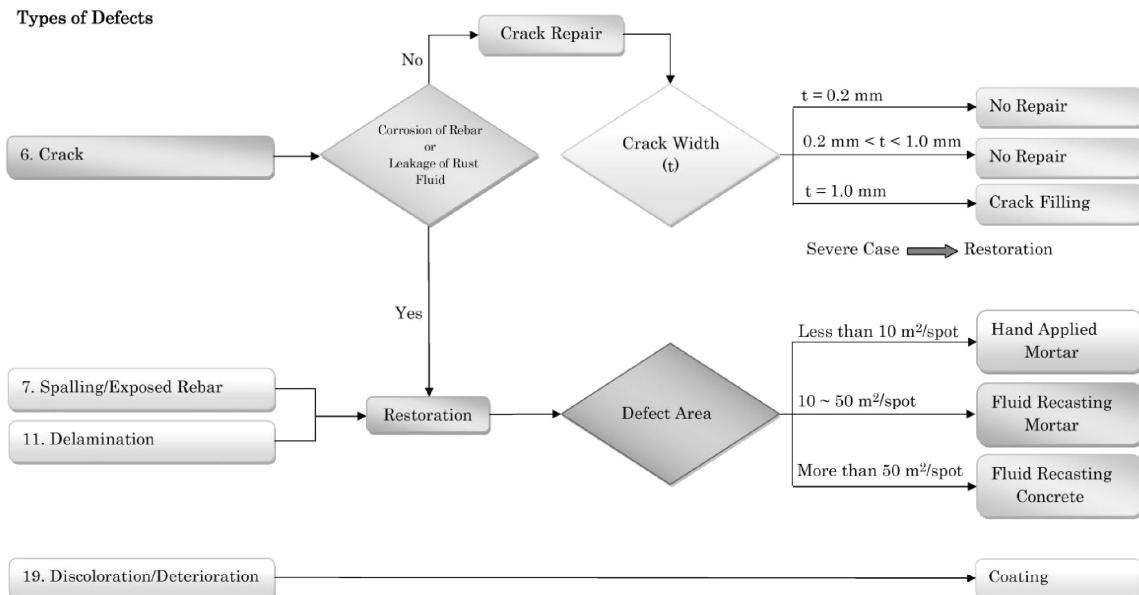


Figure 4-2 Selection Flow of Repair method of Concrete elements (Substructure)

The Flow based by Local Government Jp

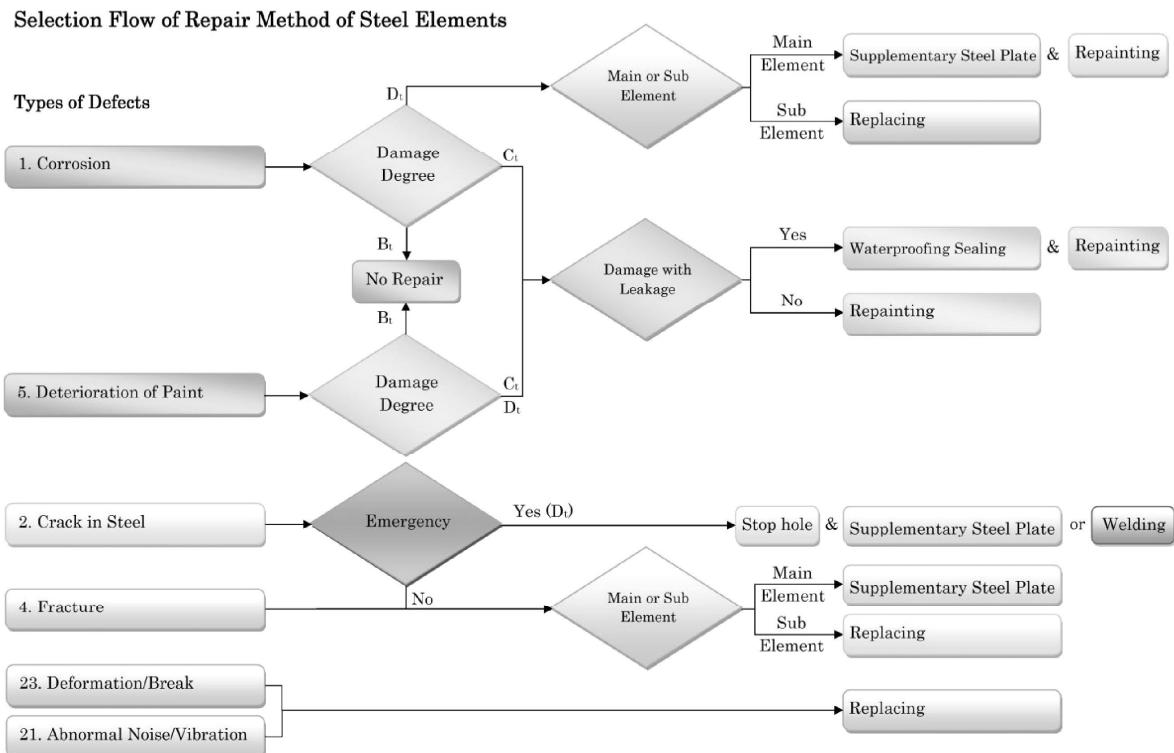


Figure 4-3 Selection Flow of Repair method of steel elements

The Flow based by Local Government Jp

Selection Flow of Repair Method of Expansion Joint

Types of Defects

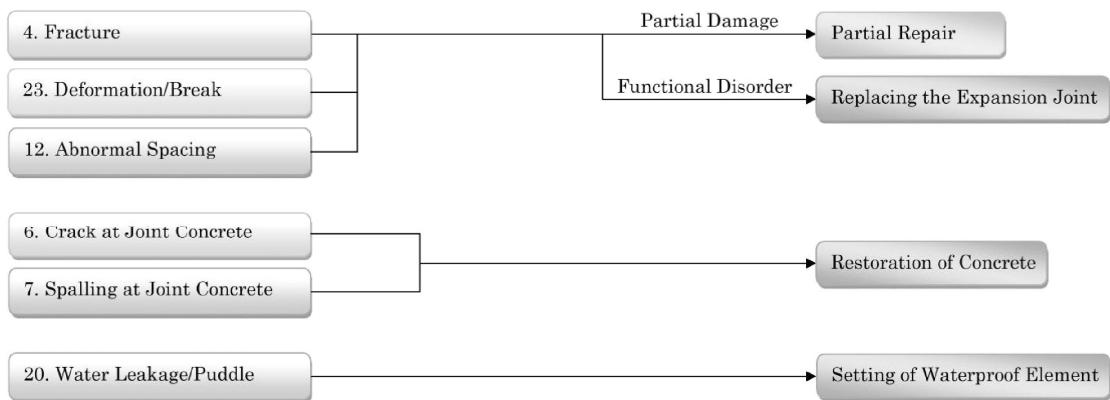


Figure 4-9 Selection Flow of Repair method of Expansion joint

The Flow based by Local Government Jp

Selection Flow of Repair Method of Bearing

Types of Defects

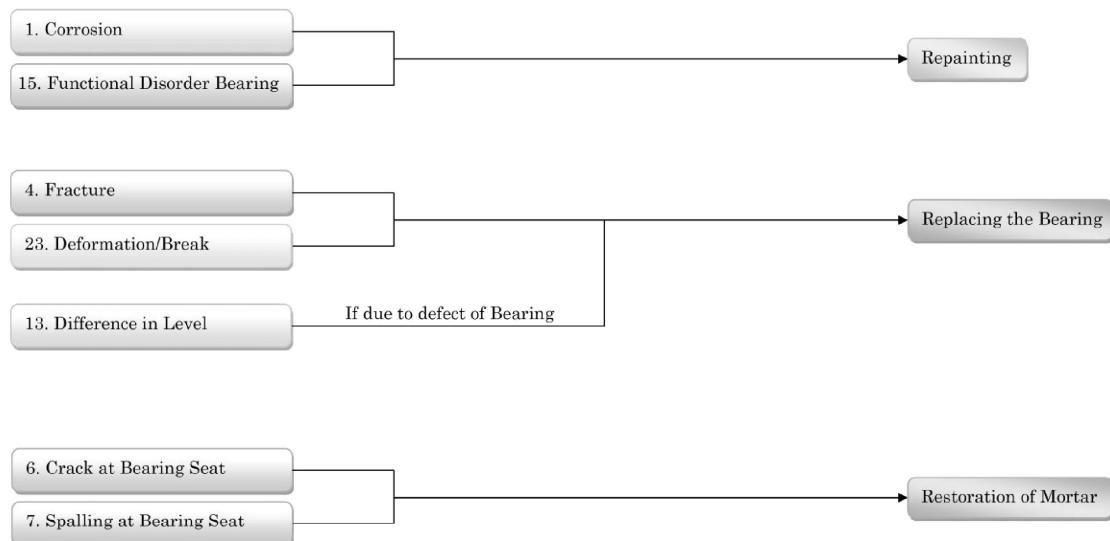


Figure 4-11 Selection Flow of Repair method of Bearing

The Flow based by Local Government Jp

Selection Flow of Repair Method of Footing

Types of Defects

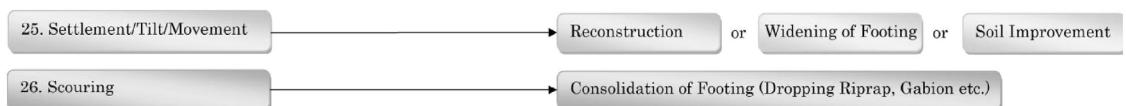


Figure 4-13 Selection Flow of Repair method of Footing

The Flow based by Local Government Jp

A P P E N D I X

SAMPLE OF COST ESTIMATE

Unit Price List of Cost Estimation

Unit Price List of Cost Estimation

No.	Item	Description	Unit	Unit Price (BDT)	Remarks	No.	Item	Description	Unit	Unit Price (BDT)	Remarks
1. Common											
1.1 Scaffoldings for Bridge Rehabilitation/Strengthening											
Cost-1	Suspended Scaffolding Work	Type A	m2	20,278	Cost-1	Cost-31	Re-painting of Steel Member		m2	2,323	Cost-31
Cost-2	Suspended Scaffolding Work	Type B	m2	20,278	Cost-2	Cost-32	Supplementing Steel Plate		m2	75,045	Cost-32
Cost-3	Suspended Scaffolding Work	Type C	m2	20,278	Cost-3	Cost-33	Supplementing Steel Plate		m2	58,768	Cost-33
Cost-4	Prefabricated Scaffolding Work		m3	812	Cost-4	Cost-34	CFRP Bonding on Steel Member		m2	24,958	Cost-41
1.2 Excavation and Backfill for Structures											
Cost-11	Excavation and Backfill Work on Land	Water Depth of 1 m or Less: Sandy Soil	m3	473	Cost-11	Cost-41	Replacement of Concrete Deck	30m length, 10.2m width and deck slab of 250mm thickness	span	4,026.677	Cost-51
Cost-12	Excavation and Backfill Work in River	Water Depth of Over 1 m: Sandy Soil	m3	585	Cost-12	Cost-61	Repairing of Bearing	0.8m x 0.8m	number	1,578	Cost-61
Cost-13	Excavation and Backfill Work in River	Water Depth of Over 1 m: Soft Rock	m3	601	Cost-13	Cost-62	Replacement of Bearing	Rubber Bearing, 200t Type	number	96,979	Cost-62
Cost-14	Excavation and Backfill Work in River	Water Depth of 1 m or Less: Soft Rock	m3	648	Cost-14	Cost-63	Strengthening of Concrete Pier with Spray Applied Mortar	10m height, 1.8m diameter and lining mortar of 70mm thickness	pier	4,026.677	Cost-51
Cost-15	Excavation and Backfill Work in River	Water Depth of Over 1 m: Soft Rock	m3	661	Cost-15	Cost-64					
2. Concrete Element											
2.1 Surface Protection Coating											
Cost-21	Surface Protection Coating		m2	2,962	Cost-21	Cost-71	Repairing of Expansion Joint		m	12,612	Cost-71
2.2 Repairing of Crack											
Cost-22	Repairing of Crack	Crack Filling	m	89	Cost-22	Cost-72	Replacement of Expansion Joint		m	34,229	Cost-72
Cost-23	Repairing of Crack	Crack Injection	m	5,419	Cost-23	Cost-81	Replacement of Asphalt Pavement without Waterproofing	30m length and 7.3m width	span	431,045	Cost-81
2.3 Concrete Restriction											
Cost-24	Concrete Restriction	Hard Applied Mortar	m3	197,579	Cost-24	Cost-82	Replacement of Asphalt Pavement with Waterproofing	30m length and 7.3m width	span	1,287,629	Cost-82
Cost-25	Concrete Restriction	Fluid Recasting Mortar	m3	95,793	Cost-25	Cost-83	Replacement of Asphalt Pavement with Waterproofing of Liquid-Tyre	30m length and 7.3m width	span	1,708,637	Cost-83
Cost-26	Concrete Restriction	Fluid Recasting Concrete	m3	100,036	Cost-26	Cost-84	Replacement of Asphalt Pavement with Waterproofing of Sheet-Type	30m length and 7.3m width	span	55,422	Cost-29
Cost-27	Concrete Restriction	Spray Applied Mortar	m3	1,938,644	Cost-27	Cost-85					
2.4 Replacement of Curb											
Cost-28	Replacement of Curb		m3	43,930	Cost-28	Cost-86	Cost-87	Cost-88	Cost-89	Cost-86	Cost-87
2.5 CFRP Bonding on Concrete Member											
Cost-29	CFRP Bonding on Concrete Member		m2	55,422	Cost-29	Cost-90	Cost-91	Cost-92	Cost-93	Cost-90	Cost-91

Unit Price List of Cost Estimation

No.	Item	Description	Unit	Unit Price (BDT)	Remarks
9. Other					
9.1	Replacement of Catch Basin and Drainage				
Cost-91	Replacement of Catch Basin and Drainage		number	5,565	Cost-91
9.2	Replacement of Railing		m	26,007	Cost-92
Cost-92	Replacement of Railing				
9.3	Additional Support for Superstructure				
Cost-93	Additional Support for Superstructure	Cast-in-place Pile	pier	9,814,855	Cost-93
Cost-94	Additional Support for Superstructure	Concrete Pier	pier	7,891,729	Cost-94
Cost-95	Additional Support for Superstructure	Bearing Installation	pier	152,909	Cost-95
9.4	Repairing of Scouring				
Cost-96	Repairing of Scouring		m3	7,009	Cost-96
9.5	Repairing of Slope Protection				
Cost-97	Repairing of Slope Protection	with Grass Sodding	m2	49	Cost-97
Cost-98	Repairing of Slope Protection	with Concrete	m2	1,979	Cost-98
9.6	Repairing of Foundation Consolidation				
Cost-99	Repairing of Foundation Consolidation		m3	13,465	Cost-99
9.7	Repairing of Block Stacking Structure				
Cost-100	Repairing of Block Stacking Structure		m3	20,312	Cost-100

A P P E N D I X

TABLES OF SETTINGS IN BMS

Bridge Type : Box Culvert		Element		Defect Type	Defect Coefficient	Quantity coefficient	BMS Defects Coefficient Setting
		Ct	Dt	Ct	Dt	Ct	No. of Rule
Common	Bridge Approach	13	Difference in Level	0.00			
		14	Abnormal Pavement	0.00			
		16	Others	0.00			
		24	Debris	0.00			
Common	Curb	6	Crack	0.00			
		7	Spalling / Exposed	0.00			
		8	Water Leakage	0.00			
		11	Delamination	0.00			
		16	Others	0.00			
		18	Abnormal Anchorage	0.00			
		23	Deformation	0.00			
Common	Drainage System	1	Corrosion	0.00			
		4	Fracture	0.00			
		5	Deterioration of Paint	0.00			
		16	Others	0.00			
		19	Discoloration of Materials	0.00			
		20	Water Leakage	0.00			
		23	Deformation	0.00			
		24	Debris	0.00			
Culvert	Footing	6	Crack	0.43	2.00	301	301
		7	Spalling / Exposed	0.57	0.50	—	301
		16	Others	0.00			
		25	Settlement	0.25	5.00	101	101
		26	Scouring	1.00	5.00	101	101
Box Culvert	Head Slab	6	Crack	0.33	2.00	301	301
		7	Spalling / Exposed	0.67	0.05	—	301
		8	Water Leakage	0.17			
		11	Delamination	0.17			
		16	Others	0.00			
		17	Reinforcing Material	0.30			
		19	Discoloration of Materials	0.32			
		20	Water Leakage	0.14			
		21	Noise / Vibration	0.50			
		23	Deformation	0.03			
Common	Lighting facility	1	Corrosion	0.00			
		2	Crack in Steel	0.00			
		3	Loose Bolts	0.00			
		4	Fracture	0.00			
		5	Deterioration of Paint	0.00			
		16	Others	0.00			
		19	Discoloration of Materials	0.00			
		23	Deformation	0.00			
Common	Pavement	13	Difference in Level	0.00			
		14	Abnormal Pavement	0.00			
		16	Others	0.00			
		24	Debris	0.00			
Common	Railing (concrete)	6	Crack	0.00			
		7	Spalling / Exposed	0.00			
		8	Water Leakage	0.00			
		11	Delamination	0.00			
		16	Others	0.00			
		18	Abnormal Anchorage	0.00			
		23	Deformation	0.00			
		—	1.00				
		—	102				

Bridge Type :	Concrete Arch Bridge	Element	Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting		Quantity coefficient Ct.	No. of Rule Dt.
					Ct.	Dt.		
Common	Abutment	6	Crack	0.43	5.00	5.00	101	101
		7	Spalling / Exposed	0.57	5.00	-	101	-
		8	Water Leakage	0.29				
		11	Delamination	0.14				
		16	Others	0.00				
		17	Reinforcing Material	0.57				
		19	Discoloration of Materials	0.14				
		20	Water Leakage	0.14				
		23	Deformation	0.14				
Common	Bearing (rubber)	1	Corrosion	0.25	1.00	1.00	101	101
		2	Crack in Steel	1.00	-	1.00	-	101
		3	Loose Bolts	0.50				
		4	Fracture	1.00	-	1.00	-	101
		5	Deterioration of Paint	0.25				
		15	Disorder of Bearing	1.00	-	1.00	-	101
		16	Others	0.00				
		20	Water Leakage	0.25				
		23	Deformation	0.13				
		24	Debris	0.13				
Common	Bearing (steel)	25	Settlement	0.88				
		1	Corrosion	0.25	1.00	1.00	101	101
		2	Crack in Steel	1.00	-	1.00	-	101
		3	Loose Bolts	0.50				
		4	Fracture	1.00	-	1.00	-	101
		5	Deterioration of Paint	0.25				
		15	Disorder of Bearing	0.75	-	1.00	-	101
		16	Others	0.00				
		20	Water Leakage	0.25				
Common	Beaming seat	23	Deformation	0.25				
		24	Debris	0.25				
		25	Settlement	0.50				
		6	Crack	0.14	-	0.25	-	101
		11	Delamination	0.29	0.25	0.25	101	101
		16	Others	0.00	0.25	0.25	101	101
		23	Deformation	1.00				
		13	Difference in Level	0.00				
Common	Bridge Approach	14	Abnormal Pavement	0.00				
		16	Others	0.00				
		24	Debris	0.00				
		6	Crack	0.40	2.00	2.00	201	203
		7	Spalling / Exposed	0.60	0.01	-	201	-
		8	Water Leakage	0.40				
		11	Delamination	0.20				
		16	Others	0.00				
		17	Reinforcing Material	0.40				
Common	Concrete Girder	18	Abnormal Anchorage	0.80				
		19	Discoloration of Materials	0.05				
		21	Noise / Vibration	1.00				
		23	Deformation	0.05				
		6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				
Common	Curb	18	Abnormal Anchorage	0.00				
		23	Deformation	0.00				
		6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				
		18	Abnormal Anchorage	0.00				
		23	Deformation	0.00				
Common	Drainage System	1	Corrosion	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
		19	Discoloration of Materials	0.03				
		20	Water Leakage	0.00				
		23	Deformation	0.00				
		24	Debris	0.00				
		12	Abnormal Spacing	0.00				
Common	Exp. - Joints (Rubber)	13	Difference in Level	0.00				
		16	Others	0.00				
		20	Water Leakage	0.00				
		21	Noise / Vibration	0.00				
		23	Deformation	0.00				
		24	Debris	0.00				
		1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
Common	Exp. - Joints (Steel)	4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		12	Abnormal Spacing	0.00				
		13	Difference in Level	0.00				
		16	Others	0.00				
		20	Water Leakage	0.00				
		21	Noise / Vibration	0.00				
		23	Deformation	0.00				
		24	Debris	0.00				
Common	Foundation	16	Others	0.00				
		25	Settlement	0.25				
		26	Scouring	1.00				
		1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
Common	Inspection Facility	20	Water Leakage	0.00				
		21	Noise / Vibration	0.00				
		23	Deformation	0.00				
		1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
Common	Lighting facility	20	Water Leakage	0.00				
		21	Noise / Vibration	0.00				
		23	Deformation	0.00				
		1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
Common	Curb	19	Discoloration of Materials	0.00				
		23	Deformation	0.00				
		6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				
		18	Abnormal Anchorage	0.00				
		23	Deformation	0.00				

Concrete Arch	Main Arch	Common	Road Sign	1 Corrosion	0.00
		6 Crack	2 Crack in Steel	0.00	
		7 Spalling / Exposed	3 Loose Bolts	0.00	
		8 Water Leakage	4 Fracture	0.00	
		11 Delamination	5 Deterioration of Paint	0.00	
		12 Abnormal Spacing	16 Others	0.00	
		18 Others	19 Discoloration of Materials	0.00	
		17 Reinforcing Material	23 Deformation	0.00	
		18 Abnormal Anchorage			
		19 Discoloration of Materials			
		21 Noise / Vibration			
		22 Abnormal Deflection			
		23 Deformation			
		0.30	0.03		
Arch	Parapet Wall	Common	Utility Pipe	1 Corrosion	0.00
		6 Crack	2 Crack in Steel	0.00	
		7 Spalling / Exposed	3 Loose Bolts	0.00	
		8 Water Leakage	4 Fracture	0.00	
		11 Delamination	5 Deterioration of Paint	0.00	
		12 Abnormal Spacing	16 Others	0.00	
		18 Others	19 Discoloration of Materials	0.00	
		19 Discoloration of Materials	23 Deformation	0.00	
		21 Noise / Vibration			
		22 Abnormal Deflection			
		23 Deformation			
		0.30	0.03		
Common	Pavement	Common	Wheel Guard	6 Crack	0.00
		13 Difference in Level	7 Spalling / Exposed	7 Spalling / Exposed	0.00
		14 Abnormal Pavement	8 Water Leakage	8 Water Leakage	0.00
		16 Others	11 Delamination	11 Delamination	0.00
		24 Debris	16 Others	16 Others	0.00
		0.00	0.00	18 Abnormal Anchorage	0.00
Common	Pier	Common	Pier	23 Deformation	0.00
		6 Crack	7 Spalling / Exposed	7 Spalling / Exposed	0.00
		8 Water Leakage	8 Water Leakage	8 Water Leakage	0.00
		11 Delamination	11 Delamination	11 Delamination	0.00
		16 Others	16 Others	16 Others	0.00
		17 Reinforcing Material	17 Reinforcing Material	17 Reinforcing Material	0.00
		19 Discoloration of Materials	19 Discoloration of Materials	19 Discoloration of Materials	0.00
		20 Water Leakage	20 Water Leakage	20 Water Leakage	0.00
		23 Deformation	23 Deformation	23 Deformation	0.00
		0.14	0.14	0.14	
Common	Railing (concrete)	Common	Railing (steel)	1 Corrosion	0.00
		6 Crack	2 Crack in Steel	2 Crack in Steel	0.00
		7 Spalling / Exposed	3 Loose Bolts	3 Loose Bolts	0.00
		8 Water Leakage	4 Fracture	4 Fracture	0.00
		11 Delamination	5 Deterioration of Paint	5 Deterioration of Paint	0.00
		16 Others	16 Others	16 Others	0.00
		18 Abnormal Anchorage	18 Abnormal Anchorage	18 Abnormal Anchorage	0.00
		23 Deformation	23 Deformation	23 Deformation	0.00
Common	Railing (steel)	Common	Railing (steel)	1 Corrosion	0.00
		6 Crack	2 Crack in Steel	2 Crack in Steel	0.00
		7 Spalling / Exposed	3 Loose Bolts	3 Loose Bolts	0.00
		8 Water Leakage	4 Fracture	4 Fracture	0.00
		11 Delamination	5 Deterioration of Paint	5 Deterioration of Paint	0.00
		16 Others	16 Others	16 Others	0.00
		18 Abnormal Anchorage	18 Abnormal Anchorage	18 Abnormal Anchorage	0.00
		23 Deformation	23 Deformation	23 Deformation	0.00
Common	Retaining wall	Common	Railing (steel)	1 Corrosion	0.00
		6 Crack	2 Crack in Steel	2 Crack in Steel	0.00
		7 Spalling / Exposed	3 Loose Bolts	3 Loose Bolts	0.00
		8 Water Leakage	4 Fracture	4 Fracture	0.00
		11 Delamination	5 Deterioration of Paint	5 Deterioration of Paint	0.00
		16 Others	16 Others	16 Others	0.00
		17 Reinforcing Material	17 Reinforcing Material	17 Reinforcing Material	0.00
		19 Discoloration of Materials	19 Discoloration of Materials	19 Discoloration of Materials	0.00
		23 Deformation	23 Deformation	23 Deformation	0.00
		25 Settlement	25 Settlement	25 Settlement	0.00
		26 Scouring	26 Scouring	26 Scouring	0.00
		5.00	5.00	5.00	
		101	101	101	
		101	101	101	

Bridge Type : Masonry Arch Bridge	Element	Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting		Quantity coefficient No. of Rule	Ct.	Dt.
				Ct.	Dt.			
Common	Abutment	6 Crack	0.43	5.00	5.00	101	101	-
		7 Spalling / Exposed	0.57	5.00	-	101		
		8 Water Leakage	0.29					
		11 Delamination	0.14					
		16 Others	0.00					
		17 Reinforcing Material	0.57					
		19 Discoloration of Materials	0.14					
		20 Water Leakage	0.14					
		23 Deformation	0.14					
Masonry Arch	Arch Rib	6 Crack	0.33					
		7 Spalling / Exposed	0.67					
		8 Water Leakage	0.17					
		11 Delamination	0.17					
		12 Abnormal Specing	0.17					
		16 Others	0.00					
		19 Discoloration of Materials	0.03					
		21 Noise / Vibration	0.50					
		22 Abnormal Deflection	0.30					
		23 Deformation	0.03					
Common	Bridge Approach	6 Crack	0.33					
		7 Spalling / Exposed	0.67					
		8 Water Leakage	0.17					
		11 Delamination	0.17					
		12 Abnormal Spoling	0.17					
		16 Others	0.00					
		17 Reinforcing Material	0.30					
		18 Abnormal Anchorage	0.00	-	-			
		19 Discoloration of Materials	0.03					
		21 Noise / Vibration	0.50					
Common	Curb	13 Difference in Level	0.00					
		14 Abnormal Pavement	0.00					
		16 Others	0.00					
		24 Debris	0.00					
Common	Drainage System	6 Crack	0.00					
		7 Spalling / Exposed	0.00					
		8 Water Leakage	0.00					
		11 Delamination	0.00					
		16 Others	0.00					
		19 Discoloration of Materials	0.00					
		20 Water Leakage	0.00					
		23 Deformation	0.00					
		24 Debris	0.00					
Common	Foundation	16 Others	0.00					
		25 Settlement	0.25	150	150	101	101	-
		26 Scouring	1.00	150	150	101	101	-
Common	Lighting facility	1 Corrosion	0.00					
		2 Crack in Steel	0.00					
		3 Loose Bolts	0.00					
		4 Fracture	0.00					
		5 Deterioration of Paint	0.00					
		16 Others	0.00					
		19 Discoloration of Materials	0.00					
		23 Deformation	0.00					
Common	Road Sign	1 Corrosion	0.00					
		2 Crack in Steel	0.00					
		3 Loose Bolts	0.00					
		4 Fracture	0.00					
		5 Deterioration of Paint	0.00					
		16 Others	0.00					
		19 Discoloration of Materials	0.00					
		23 Deformation	0.00					
Common	Utility Pipe	1 Corrosion	0.00					
		2 Crack in Steel	0.00					
		3 Loose Bolts	0.00					
		4 Fracture	0.00					
		5 Deterioration of Paint	0.00					
		16 Others	0.00					
		19 Discoloration of Materials	0.00					
		23 Deformation	0.00					
Common	Wheel Guard	6 Crack	0.00					
		7 Spalling / Exposed	0.00					
		8 Water Leakage	0.00					
		11 Delamination	0.00					
		16 Others	0.00					
		18 Abnormal Anchorage	0.00					
		23 Deformation	0.00					

Bridge Type : Masonry Arch Bridge

Element

Defect Type

Defect Coefficient:

Quantity coefficient
No. of Rule

Ct.

Dt.

Bridge Type : PC Box Girder Bridge		(same as RC Box Girder Bridge)		BMS Defects Coefficient Setting		Quantity coefficient No. of Rule	Ct.	Dt.	Ct.	Dt.	Ct.	Dt.
Element	Defect Type	Defect	Coefficient:	Quantity coefficient	No. of Rule							
Common	Abutment	6 Crack	0.43	5.00	101	101						
		7 Spalling / Exposed	0.57	5.00	—	101						
		8 Water Leakage	0.29									
		11 Delamination	0.14									
		16 Others	0.00									
		17 Reinforcing Material	0.57									
		19 Discoloration of Materials	0.14									
		20 Water Leakage	0.14									
		23 Deformation	0.14									
Common	Bearing (rubber)	1 Corrosion	0.25	1.00	101	101						
		2 Crack in Steel	1.00	—	1.00	—						
		3 Loose Bolts	0.50									
		4 Fracture	1.00	—	1.00	—						
		5 Deterioration of Paint	0.25									
		15 Disorder of Bearing	1.00	—	1.00	—						
		16 Others	0.00									
		20 Water Leakage	0.25									
		23 Deformation	0.13									
		24 Debris	0.13									
		25 Settlement	0.88									
Common	Bearing (steel)	1 Corrosion	0.25	1.00	101	101						
		2 Crack in Steel	1.00	—	1.00	—						
		3 Loose Bolts	0.50									
		4 Fracture	1.00	—	1.00	—						
		5 Deterioration of Paint	0.25									
		15 Disorder of Bearing	0.75	—	1.00	—						
		16 Others	0.00									
		20 Water Leakage	0.25									
		23 Deformation	0.25									
		24 Debris	0.25									
		25 Settlement	0.50									
Common	Beaming seat	6 Crack	0.14	—	0.25	—						
		11 Delamination	0.29	0.25	0.25	101						
		16 Others	0.00		0.25	101						
		23 Deformation	1.00	0.25	0.25	101						
Common	Bridge Approach	13 Difference in Level	0.00									
		14 Abnormal Pavement	0.00									
		16 Others	0.00									
		24 Debris	0.00									
Concrete Girder	Cross beam	6 Crack	0.40	2.00	201	203						
		7 Spalling / Exposed	0.60	0.01	—	201						
		8 Water Leakage	0.40									
		11 Delamination	0.20									
		16 Others	0.00									
		17 Reinforcing Material	0.40									
		18 Abnormal Anchorage	0.80									
		19 Discoloration of Materials	0.05									
		21 Noise / Vibration	1.00									
		23 Deformation	0.05									
Common	Curb	6 Crack	0.00									
		7 Spalling / Exposed	0.00									
		8 Water Leakage	0.00									
		11 Delamination	0.00									
		16 Others	0.00									
		18 Abnormal Anchorage	0.00									
		23 Deformation	0.00									
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10									
		8 Water Leakage	0.10									
		9 Fallen out of Deck	1.00									
		10 Crack of Deck	0.75									
		11 Delamination	0.03									
		16 Others	0.00									
		17 Reinforcing Material	0.25									
		18 Abnormal Anchorage	0.25									
		19 Discoloration of Materials	0.03									
Common	Drainage System	1 Corrosion	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		16 Others	0.00									
		19 Discoloration of Materials	0.00									
Common	Exp. Joints (Rubber)	12 Abnormal Spacing	0.00									
		13 Difference in Level	0.00									
		16 Others	0.00									
		20 Water Leakage	0.00									
		21 Noise / Vibration	0.00									
		23 Deformation	0.00									
		24 Debris	0.00									
Common	Exp. Joints (Steel)	1 Corrosion	0.00									
		2 Crack in Steel	0.00									
		3 Loose Bolts	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		12 Abnormal Spacing	0.00									
		13 Difference in Level	0.00									
		16 Others	0.00									
		20 Water Leakage	0.00									
		21 Noise / Vibration	0.00									
		23 Deformation	0.00									
		24 Debris	0.00									
Common	Foundation	16 Others	0.00									
		25 Settlement	0.25									
		26 Scouring	1.00									
Common	Inspection Facility	1 Corrosion	0.00									
		2 Crack in Steel	0.00									
		3 Loose Bolts	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		16 Others	0.00									
		20 Water Leakage	0.00									
		21 Noise / Vibration	0.00									
		23 Deformation	0.00									
Common	Lighting facility	1 Corrosion	0.00									
		2 Crack in Steel	0.00									
		3 Loose Bolts	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		16 Others	0.00									
		19 Discoloration of Materials	0.00									
		23 Deformation	0.00									

Category	Type	Sub-Type	Count		Percentage
			Common	Specific	
Concrete Box	Main Gerdor	Crack	0.50	1.00	205
		Spalling / Exposed	0.05	-	204
		Water Leakage	0.17	-	-
		Delamination	0.17	-	-
		Abnormal Spacing	0.17	-	-
		Others	0.00	-	-
	Reinforcing Material	Crack	0.16	-	101
		Spalling / Exposed	0.30	-	-
		Water Leakage	0.67	-	-
		Delamination	0.17	-	-
		Abnormal Anchorage	0.03	-	-
		Discoloration of Materials	0.03	-	-
	Noise / Vibration	Crack	0.50	-	-
		Spalling / Exposed	0.30	-	-
		Water Leakage	0.17	-	-
		Delamination	0.17	-	-
	Abnormal Deflection	Crack	0.50	-	-
		Spalling / Exposed	0.03	-	-
		Water Leakage	0.17	-	-
		Delamination	0.17	-	-
	Deformation	Crack	0.33	-	-
		Spalling / Exposed	0.67	-	-
		Water Leakage	0.17	-	-
		Delamination	0.17	-	-
	Pavement	Difference in Level	0.00	-	-
		Abnormal Pavement	0.00	-	-
		Others	0.00	-	-
		Debris	0.00	-	-
Common	Pier	Crack	0.43	-	101
		Spalling / Exposed	0.57	-	101
		Water Leakage	0.29	-	-
		Delamination	0.14	-	-
		Others	0.00	-	-
	Reinforcing Material	Crack	0.57	-	-
		Spalling / Exposed	0.14	-	-
		Water Leakage	0.14	-	-
		Delamination	0.14	-	-
		Abnormal Anchorage	0.14	-	-
		Deformation	0.14	-	-
Common	Railing (concrete)	Crack	0.00	-	-
		Spalling / Exposed	0.00	-	-
		Water Leakage	0.00	-	-
		Delamination	0.00	-	-
		Others	0.00	-	-
		Abnormal Anchorage	0.00	-	-
		Deformation	0.00	-	-
	Railing (steel)	Corrosion	0.00	-	-
		Crack in Steel	0.00	-	-
		Loose Bolts	0.00	-	-
		Fracture	0.00	-	-
		Deterioration of Paint	0.00	-	-
		Others	0.00	-	-
		Settlement	0.00	-	-
		Scouring	0.00	-	-
Common	Retaining wall	Crack	5.00	101	101
		Spalling / Exposed	5.00	-	-
		Water Leakage	0.00	-	-
		Delamination	0.00	-	-
		Fracture	0.00	-	-
		Deterioration of Paint	0.00	-	-
		Others	0.00	-	-
		Settlement	0.00	-	-
		Deformation	5.00	101	101
Common	Road Sign	Corrosion	0.00	-	-
		Crack in Steel	0.00	-	-
		Loose Bolts	0.00	-	-
		Fracture	0.00	-	-
		Deterioration of Paint	0.00	-	-
		Others	0.00	-	-
		Settlement	0.00	-	-
		Deformation	0.00	-	-

Bridge Type : PC Girder Bridge		(same as RC Girder Bridge)		BMS Defects Coefficient Setting		Quantity coefficient No. of Rule	Ct.	Dt.	Ct.	Dt.	Ct.	Dt.
Element	Defect Type	Coefficient:	Defect Type	Coefficient:								
Common	Abutment	6 Crack	0.43	5.00	5.00	101	101					
		7 Spalling / Exposed	0.57	5.00	—	101	—					
		8 Water Leakage	0.29									
		11 Delamination	0.14									
		16 Others	0.00									
		17 Reinforcing Material	0.57									
		19 Discoloration of Materials	0.14									
		20 Water Leakage	0.14									
		23 Deformation	0.14									
Common	Bearing (rubber)	1 Corrosion	0.25	1.00	1.00	101	101					
		2 Crack in Steel	1.00	—	1.00	—	101	—				
		3 Loose Bolts	0.50									
		4 Fracture	1.00	—	1.00	—	101	—				
		5 Deterioration of Paint	0.25	1.00	—	1.00	—	101	—			
		15 Disorder of Bearing	1.00	—	1.00	—	101	—				
		16 Others	0.00									
		20 Water Leakage	0.25									
		23 Deformation	0.13									
		24 Debris	0.13									
		25 Settlement	0.88									
Common	Bearing (steel)	1 Corrosion	0.25	1.00	1.00	101	101					
		2 Crack in Steel	1.00	—	1.00	—	101	—				
		3 Loose Bolts	0.50									
		4 Fracture	1.00	—	1.00	—	101	—				
		5 Deterioration of Paint	0.25	1.00	—	1.00	—	101	—			
		15 Disorder of Bearing	0.75	—	1.00	—	101	—				
		16 Others	0.00									
		20 Water Leakage	0.25									
		23 Deformation	0.25									
		24 Debris	0.25									
		25 Settlement	0.50									
Common	Beaming seat	6 Crack	0.14	—	0.25	—	101	—				
		11 Delamination	0.29	0.25	0.25	101	101					
		16 Others	0.00	0.00	0.25	101	101					
		23 Deformation	1.00	0.00	0.25	101	101					
Common	Bridge Approach	13 Difference in Level	0.00									
		14 Abnormal Pavement	0.00									
		16 Others	0.00									
		24 Debris	0.00									
Concrete Girder	Cross beam	6 Crack	0.40	2.00	2.00	201	203					
		7 Spalling / Exposed	0.60	0.01	—	201	—					
		8 Water Leakage	0.40									
		11 Delamination	0.20									
		16 Others	0.00									
		17 Reinforcing Material	0.40									
		18 Abnormal Anchorage	0.80									
		19 Discoloration of Materials	0.05									
		21 Noise / Vibration	1.00									
		23 Deformation	0.05									
Common	Curb	6 Crack	0.00									
		7 Spalling / Exposed	0.00									
		8 Water Leakage	0.00									
		11 Delamination	0.00									
		16 Others	0.00									
		18 Abnormal Anchorage	0.00									
		23 Deformation	0.00									
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10									
		8 Water Leakage	0.10									
		9 Fallen out of Deck	1.00									
		10 Crack of Deck	0.75									
		11 Delamination	0.03									
		16 Others	0.00									
		17 Reinforcing Material	0.25									
		18 Abnormal Anchorage	0.25									
		19 Discoloration of Materials	0.03									
Common	Drainage System	1 Corrosion	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		16 Others	0.00									
		19 Discoloration of Materials	0.00									
Common	Exp. Joints (Rubber)	12 Abnormal Spacing	0.00									
		13 Difference in Level	0.00									
		16 Others	0.00									
		20 Water Leakage	0.00									
		21 Noise / Vibration	0.00									
		23 Deformation	0.00									
		24 Debris	0.00									
Common	Exp. Joints (Steel)	1 Corrosion	0.00									
		2 Crack in Steel	0.00									
		3 Loose Bolts	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		12 Abnormal Spacing	0.00									
		13 Difference in Level	0.00									
		16 Others	0.00									
		20 Water Leakage	0.00									
		21 Noise / Vibration	0.00									
		23 Deformation	0.00									
Common	Foundation	16 Others	0.00									
		25 Settlement	0.25									
		26 Scouring	1.00									
Common	Inspection Facility	1 Corrosion	0.00									
		2 Crack in Steel	0.00									
		3 Loose Bolts	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		16 Others	0.00									
		20 Water Leakage	0.00									
		21 Noise / Vibration	0.00									
		23 Deformation	0.00									
Common	Lighting facility	1 Corrosion	0.00									
		2 Crack in Steel	0.00									
		3 Loose Bolts	0.00									
		4 Fracture	0.00									
		5 Deterioration of Paint	0.00									
		16 Others	0.00									
		19 Discoloration of Materials	0.00									
		23 Deformation	0.00									

Concrete Girder	Main Girder	Common	Utility Pipe	1 Corrosion	0.00
		6 Crack	0.33	205 Crack in Steel	0.00
		7 Spalling / Exposed	0.67	204 Loose Bolts	0.00
		8 Water Leakage	0.17	12 Delamination	0.00
		11 Abnormal Spacing	0.17	13 Reinforcing Material	0.00
		12 Others	0.00	14 Abnormal Anchorage	0.00
		15 Noise / Vibration	0.50	15 Discoloration of Materials	0.03
		16 Abnormal Deflection	0.30	16 Deformation	0.00
		17 Abnormal Deflection	0.03	17 Spalling / Exposed	0.00
		18 Deformation	0.03	18 Water Leakage	0.00
		19 Delamination	0.33	19 Deterioration of Paint	0.00
		20 Others	0.00	20 Others	0.00
		21 Difference in Level	0.50	21 Discoloration of Materials	0.00
		22 Abnormal Deflection	0.30	22 Deformation	0.00
		23 Deformation	0.03	23 Deformation	0.00
		24 Debris	0.00	24 Debris	0.00
		25 Deformation	0.00	25 Deformation	0.00
		26 Delamination	0.14	26 Delamination	0.00
		27 Others	0.00	27 Others	0.00
		28 Abnormal Anchorage	0.00	28 Abnormal Anchorage	0.00
		29 Deformation	0.14	29 Deformation	0.00
		30 Deformation	0.00	30 Deformation	0.00
		31 Delamination	0.14	31 Delamination	0.00
		32 Others	0.00	32 Others	0.00
		33 Water Leakage	0.29	33 Water Leakage	0.00
		34 Deformation	0.00	34 Deformation	0.00
		35 Delamination	0.14	35 Delamination	0.00
		36 Others	0.00	36 Others	0.00
		37 Abnormal Anchorage	0.00	37 Abnormal Anchorage	0.00
		38 Deformation	0.00	38 Deformation	0.00
		39 Deformation	0.00	39 Deformation	0.00
		40 Delamination	0.00	40 Delamination	0.00
		41 Others	0.00	41 Others	0.00
		42 Abnormal Anchorage	0.00	42 Abnormal Anchorage	0.00
		43 Deformation	0.00	43 Deformation	0.00
		44 Delamination	0.00	44 Delamination	0.00
		45 Others	0.00	45 Others	0.00
		46 Abnormal Anchorage	0.00	46 Abnormal Anchorage	0.00
		47 Deformation	0.00	47 Deformation	0.00
		48 Delamination	0.00	48 Delamination	0.00
		49 Others	0.00	49 Others	0.00
		50 Abnormal Anchorage	0.00	50 Abnormal Anchorage	0.00
		51 Deformation	0.00	51 Deformation	0.00
		52 Delamination	0.00	52 Delamination	0.00
		53 Others	0.00	53 Others	0.00
		54 Abnormal Anchorage	0.00	54 Abnormal Anchorage	0.00
		55 Deformation	0.00	55 Deformation	0.00
		56 Delamination	0.00	56 Delamination	0.00
		57 Others	0.00	57 Others	0.00
		58 Abnormal Anchorage	0.00	58 Abnormal Anchorage	0.00
		59 Deformation	0.00	59 Deformation	0.00
		60 Delamination	0.00	60 Delamination	0.00
		61 Others	0.00	61 Others	0.00
		62 Abnormal Anchorage	0.00	62 Abnormal Anchorage	0.00
		63 Deformation	0.00	63 Deformation	0.00
		64 Delamination	0.00	64 Delamination	0.00
		65 Others	0.00	65 Others	0.00
		66 Abnormal Anchorage	0.00	66 Abnormal Anchorage	0.00
		67 Deformation	0.00	67 Deformation	0.00
		68 Delamination	0.00	68 Delamination	0.00
		69 Others	0.00	69 Others	0.00
		70 Abnormal Anchorage	0.00	70 Abnormal Anchorage	0.00
		71 Deformation	0.00	71 Deformation	0.00
		72 Delamination	0.00	72 Delamination	0.00
		73 Others	0.00	73 Others	0.00
		74 Abnormal Anchorage	0.00	74 Abnormal Anchorage	0.00
		75 Deformation	0.00	75 Deformation	0.00
		76 Delamination	0.00	76 Delamination	0.00
		77 Others	0.00	77 Others	0.00
		78 Abnormal Anchorage	0.00	78 Abnormal Anchorage	0.00
		79 Deformation	0.00	79 Deformation	0.00
		80 Delamination	0.00	80 Delamination	0.00
		81 Others	0.00	81 Others	0.00
		82 Abnormal Anchorage	0.00	82 Abnormal Anchorage	0.00
		83 Deformation	0.00	83 Deformation	0.00
		84 Delamination	0.00	84 Delamination	0.00
		85 Others	0.00	85 Others	0.00
		86 Abnormal Anchorage	0.00	86 Abnormal Anchorage	0.00
		87 Deformation	0.00	87 Deformation	0.00
		88 Delamination	0.00	88 Delamination	0.00
		89 Others	0.00	89 Others	0.00
		90 Abnormal Anchorage	0.00	90 Abnormal Anchorage	0.00
		91 Deformation	0.00	91 Deformation	0.00
		92 Delamination	0.00	92 Delamination	0.00
		93 Others	0.00	93 Others	0.00
		94 Abnormal Anchorage	0.00	94 Abnormal Anchorage	0.00
		95 Deformation	0.00	95 Deformation	0.00
		96 Delamination	0.00	96 Delamination	0.00
		97 Others	0.00	97 Others	0.00
		98 Abnormal Anchorage	0.00	98 Abnormal Anchorage	0.00
		99 Deformation	0.00	99 Deformation	0.00
		100 Delamination	0.00	100 Delamination	0.00
		101 Others	0.00	101 Others	0.00
		102 Abnormal Anchorage	0.00	102 Abnormal Anchorage	0.00
		103 Deformation	0.00	103 Deformation	0.00
		104 Delamination	0.00	104 Delamination	0.00
		105 Others	0.00	105 Others	0.00
		106 Abnormal Anchorage	0.00	106 Abnormal Anchorage	0.00
		107 Deformation	0.00	107 Deformation	0.00
		108 Delamination	0.00	108 Delamination	0.00
		109 Others	0.00	109 Others	0.00
		110 Abnormal Anchorage	0.00	110 Abnormal Anchorage	0.00
		111 Deformation	0.00	111 Deformation	0.00
		112 Delamination	0.00	112 Delamination	0.00
		113 Others	0.00	113 Others	0.00
		114 Abnormal Anchorage	0.00	114 Abnormal Anchorage	0.00
		115 Deformation	0.00	115 Deformation	0.00
		116 Delamination	0.00	116 Delamination	0.00
		117 Others	0.00	117 Others	0.00
		118 Abnormal Anchorage	0.00	118 Abnormal Anchorage	0.00
		119 Deformation	0.00	119 Deformation	0.00
		120 Delamination	0.00	120 Delamination	0.00
		121 Others	0.00	121 Others	0.00
		122 Abnormal Anchorage	0.00	122 Abnormal Anchorage	0.00
		123 Deformation	0.00	123 Deformation	0.00
		124 Delamination	0.00	124 Delamination	0.00
		125 Others	0.00	125 Others	0.00
		126 Abnormal Anchorage	0.00	126 Abnormal Anchorage	0.00
		127 Deformation	0.00	127 Deformation	0.00
		128 Delamination	0.00	128 Delamination	0.00
		129 Others	0.00	129 Others	0.00
		130 Abnormal Anchorage	0.00	130 Abnormal Anchorage	0.00
		131 Deformation	0.00	131 Deformation	0.00
		132 Delamination	0.00	132 Delamination	0.00
		133 Others	0.00	133 Others	0.00
		134 Abnormal Anchorage	0.00	134 Abnormal Anchorage	0.00
		135 Deformation	0.00	135 Deformation	0.00
		136 Delamination	0.00	136 Delamination	0.00
		137 Others	0.00	137 Others	0.00
		138 Abnormal Anchorage	0.00	138 Abnormal Anchorage	0.00
		139 Deformation	0.00	139 Deformation	0.00
		140 Delamination	0.00	140 Delamination	0.00
		141 Others	0.00	141 Others	0.00
		142 Abnormal Anchorage	0.00	142 Abnormal Anchorage	0.00
		143 Deformation	0.00	143 Deformation	0.00
		144 Delamination	0.00	144 Delamination	0.00
		145 Others	0.00	145 Others	0.00
		146 Abnormal Anchorage	0.00	146 Abnormal Anchorage	0.00
		147 Deformation	0.00	147 Deformation	0.00
		148 Delamination	0.00	148 Delamination	0.00
		149 Others	0.00	149 Others	0.00
		150 Abnormal Anchorage	0.00	150 Abnormal Anchorage	0.00
		151 Deformation	0.00	151 Deformation	0.00
		152 Delamination	0.00	152 Delamination	0.00
		153 Others	0.00	153 Others	0.00
		154 Abnormal Anchorage	0.00	154 Abnormal Anchorage	0.00
		155 Deformation	0.00	155 Deformation	0.00
		156 Delamination	0.00	156 Delamination	0.00
		157 Others	0.00	157 Others	0.00
		158 Abnormal Anchorage	0.00	158 Abnormal Anchorage	0.00
		159 Deformation	0.00	159 Deformation	0.00
		160 Delamination	0.00	160 Delamination	0.00
		161 Others	0.00	161 Others	0.00
		162 Abnormal Anchorage	0.00	162 Abnormal Anchorage	0.00
		163 Deformation	0.00	163 Deformation	0.00
		164 Delamination	0.00	164 Delamination	0.00
		165 Others	0.00	165 Others	0.00
		166 Abnormal Anchorage	0.00	166 Abnormal Anchorage	

Bridge Type : Portable Steel Bridge		Element		Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting		Quantity coefficient No. of Rule Ct. Dt.	Common	Deck Slab (steel)	
						5.00	5.00			1	Corrosion
Common	Abutment	6	Crack	0.43	5.00	5.00	101	101	2	Crack in Steel	1.00
		7	Spalling / Exposed	0.57	5.00	—	101	—	3	Loose Bolts	0.17
		8	Water Leakage	0.29					4	Fracture	1.00
		11	Delamination	0.14					5	Deterioration of Paint	0.17
		16	Others	0.00					16	Others	0.00
		17	Reinforcing Material	0.57					21	Noise / Vibration	0.17
		19	Discoloration of Materials	0.14					23	Deformation	0.17
		20	Water Leakage	0.14							
		23	Deformation	0.14							
Common	Bearing (rubber)	1	Corrosion	0.25	1.00	1.00	101	101	1	Corrosion	0.00
		2	Crack in Steel	1.00	—	1.00	—	101	2	Fracture	0.00
		3	Loose Bolts	0.50					5	Deterioration of Paint	0.00
		4	Fracture	1.00	—	1.00	—	101	16	Others	0.00
		5	Deterioration of Paint	0.25	1.00	—	101	—	19	Discoloration of Materials	0.00
		15	Disorder of Bearing	1.00	—	1.00	—	101	20	Water Leakage	0.00
		16	Others	0.00					21	Noise / Vibration	0.00
		20	Water Leakage	0.25					23	Deformation	0.00
		23	Deformation	0.13					24	Debris	0.00
		24	Debris	0.13							
		25	Settlement	0.88							
Common	Bearing (steel)	1	Corrosion	0.25	1.00	1.00	101	101	1	Corrosion	0.00
		2	Crack in Steel	1.00	—	1.00	—	101	2	Crack in Steel	0.00
		3	Loose Bolts	0.50					3	Loose Bolts	0.00
		4	Fracture	1.00	—	1.00	—	101	4	Fracture	0.00
		5	Deterioration of Paint	0.25	1.00	—	101	—	5	Deterioration of Paint	0.00
		15	Disorder of Bearing	0.75	—	1.00	—	101	12	Abnormal Spacing	0.00
		16	Others	0.00					13	Difference in Level	0.00
		20	Water Leakage	0.25					16	Others	0.00
		23	Deformation	0.25					20	Water Leakage	0.00
		24	Debris	0.25					21	Noise / Vibration	0.00
		25	Settlement	0.50					23	Deformation	0.00
		25	Settlement	0.50					24	Debris	0.00
Common	Beading seat	6	Crack	0.14	—	0.25	—	101	1	Corrosion	0.00
		11	Delamination	0.29	0.25	0.25	101	101	2	Crack in Steel	0.00
		16	Others	0.00					3	Loose Bolts	0.00
		23	Deformation	1.00	0.25	0.25	101	101	4	Fracture	0.00
									5	Deterioration of Paint	0.00
Common	Bridge Approach	13	Difference in Level	0.00					16	Others	0.00
		14	Abnormal Pavement	0.00					17	Reinforcing Material	0.00
		16	Others	0.00					23	Deformation	0.00
		24	Debris	0.00							
Portable Steel Truss Steel Arch	Cross beam	1	Corrosion	0.33	3.00	3.00	101	101	1	Corrosion	0.00
		2	Crack in Steel	1.00	1.00	1.00	101	101	2	Crack in Steel	0.00
		3	Loose Bolts	0.17					3	Loose Bolts	0.00
		4	Fracture	1.00	—	1.00	—	101	4	Fracture	0.00
		5	Deterioration of Paint	0.17	1.40	—	201	—	5	Deterioration of Paint	0.00
		16	Others	0.33					16	Others	0.00
		21	Noise / Vibration	0.33					19	Discoloration of Materials	0.00
		23	Deformation	0.17					23	Deformation	0.00
Common	Curb	6	Crack	0.00					15	Disorder of Bearing	0.75
		7	Spalling / Exposed	0.00					6	Crack	0.33
		8	Water Leakage	0.00					7	Spalling / Exposed	0.67
		11	Delamination	0.00					8	Water Leakage	0.17
		16	Others	0.00					11	Delamination	0.17
		18	Abnormal Anchorage	0.00					15	Disorder of Bearing	0.75
		23	Deformation	0.00						101	101

Portable Steel Truss	Main Truss	Common	Utility Pipe	1 Corrosion	0.00
		2 Crack in Steel	1.00	101	101
	Pier	3 Loose Bolts	0.20	101	101
		4 Fracture	1.00	-	101
	Railing (steel)	5 Deterioration of Paint	0.20	-	203
		12 Abnormal Spacing	0.20	1.00	-
	Road Sign	16 Others	0.00		
		17 Reinforcing Material	0.20		
	Stringer	20 Water Leakage	0.20		
		21 Noise /Vibration	0.20		
	Retaining wall	22 Abnormal Deflection	0.20		
		23 Deformation	0.20		
	Common	Common	Wheel Guard	6 Crack	0.00
		7 Spalling / Exposed	0.00	8 Water Leakage	0.00
	Pavement	8 Delamination	0.14	9 Deterioration of Materials	0.00
		11 Others	0.00	10 Others	0.00
	Common	13 Difference in Level	0.00	11 Abnormal Anchorage	0.00
		14 Abnormal Pavement	0.00	12 Deformation	0.00
	Common	16 Others	0.00		
		24 Debris	0.00		
	Common	6 Crack	0.43	10.00	101
		7 Spalling / Exposed	0.57	10.00	-
	Common	8 Water Leakage	0.29		
		11 Delamination	0.14		
	Common	16 Others	0.00		
		17 Reinforcing Material	0.57		
	Common	19 Discoloration of Materials	0.14		
		20 Water Leakage	0.14		
	Common	23 Deformation	0.14		
		23 Deformation	0.00		
	Common	1 Corrosion	0.00		
		2 Crack in Steel	0.00		
	Common	3 Loose Bolts	0.00		
		4 Fracture	0.00		
	Common	5 Deterioration of Paint	0.00		
		16 Others	0.00		
	Common	17 Reinforcing Material	0.00		
		19 Discoloration of Materials	0.00		
	Common	23 Deformation	0.00		
		25 Settlement	0.00	5.00	101
	Common	26 Scouring	0.00	5.00	101
		23 Deformation	0.00	5.00	101
	Common	1 Corrosion	0.00		
		2 Crack in Steel	0.00		
	Common	3 Loose Bolts	0.00		
		4 Fracture	0.00		
	Common	5 Deterioration of Paint	0.00		
		16 Others	0.00		
	Common	17 Reinforcing Material	0.00		
		21 Noise /Vibration	0.00		
	Common	22 Abnormal Deflection	0.00		
		23 Deformation	0.00		

Bridge Type : RC Box Girder Bridge		(same as PC Box Girder Bridge)		BMS Defects Coefficient Setting		Quantity coefficient No. of Rule	Ct.	Dt.	Ct.	Dt.	Ct.	Dt.
Element	Defect Type	Defect	Coefficient:	Spalling / Exposed	Water Leakage							
Common	Abutment	6 Crack	0.43	5.00	5.00	101	101	101	101	-	0.05	-
Common		7 Spalling / Exposed	0.57	5.00	-	101	-	101	-	1.00	-	201
Common		8 Water Leakage	0.29	-	-	-	-	-	-	1.00	-	202
Common		11 Delamination	0.14	-	-	-	-	-	-	0.75	2.00	202
Common		16 Others	0.00	-	-	-	-	-	-	0.03	-	202
Common		17 Reinforcing Material	0.57	-	-	-	-	-	-	0.03	-	202
Common		19 Discoloration of Materials	0.14	-	-	-	-	-	-	0.03	-	202
Common		20 Water Leakage	0.14	-	-	-	-	-	-	0.03	-	202
Common		23 Deformation	0.14	-	-	-	-	-	-	0.03	-	202
Common	Bearing (rubber)	1 Corrosion	0.25	1.00	1.00	101	101	101	101	1.00	1.00	103
Common		2 Crack in Steel	1.00	-	1.00	-	-	-	-	1.00	1.00	103
Common		3 Loose Bolts	0.50	-	-	-	-	-	-	0.00	0.00	103
Common		4 Fracture	1.00	-	1.00	-	-	-	-	0.00	0.00	103
Common		5 Deterioration of Paint	0.25	-	-	-	-	-	-	0.00	0.00	103
Common		15 Disorder of Bearing	1.00	-	1.00	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		20 Water Leakage	0.25	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.13	-	-	-	-	-	-	0.00	0.00	103
Common		24 Debris	0.13	-	-	-	-	-	-	0.00	0.00	103
Common		25 Settlement	0.88	-	-	-	-	-	-	0.00	0.00	103
Common	Bearing (steel)	1 Corrosion	0.25	1.00	1.00	101	101	101	101	1.00	1.00	103
Common		2 Crack in Steel	1.00	-	1.00	-	-	-	-	0.00	0.00	103
Common		3 Loose Bolts	0.50	-	-	-	-	-	-	0.00	0.00	103
Common		4 Fracture	1.00	-	1.00	-	-	-	-	0.00	0.00	103
Common		5 Deterioration of Paint	0.25	1.00	-	101	-	101	-	0.00	0.00	103
Common		15 Disorder of Bearing	0.75	-	1.00	-	-	101	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		20 Water Leakage	0.25	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.25	-	-	-	-	-	-	0.00	0.00	103
Common		24 Debris	0.25	-	-	-	-	-	-	0.00	0.00	103
Common		25 Settlement	0.50	-	-	-	-	-	-	0.00	0.00	103
Common	Beaming seat	6 Crack	0.14	-	0.25	-	-	101	-	0.00	0.00	103
Common		11 Delamination	0.29	0.25	0.25	101	101	101	101	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	1.00	0.25	0.25	101	101	101	101	0.00	0.00	103
Common	Bridge Approach	13 Difference in Level	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		14 Abnormal Pavement	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		24 Debris	0.00	-	-	-	-	-	-	0.00	0.00	103
Common	Cross beam	6 Crack	0.40	2.00	2.00	201	203	201	201	1.00	1.00	103
Common		7 Spalling / Exposed	0.60	0.01	-	201	-	201	-	0.00	0.00	103
Common		8 Water Leakage	0.40	-	-	-	-	-	-	0.00	0.00	103
Common		11 Delamination	0.20	-	-	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		17 Reinforcing Material	0.40	-	-	-	-	-	-	0.00	0.00	103
Common		18 Abnormal Anchorage	0.80	-	-	-	-	-	-	0.00	0.00	103
Common		19 Discoloration of Materials	0.05	-	-	-	-	-	-	0.00	0.00	103
Common		21 Noise / Vibration	1.00	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.05	-	-	-	-	-	-	0.00	0.00	103
Common	Curb	6 Crack	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		7 Spalling / Exposed	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		8 Water Leakage	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		11 Delamination	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		18 Abnormal Anchorage	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.00	-	-	-	-	-	-	0.00	0.00	103
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10	-	-	-	-	-	-	0.05	-	202
Common		8 Water Leakage	0.10	-	-	-	-	-	-	1.00	-	201
Common		9 Fallen out of Deck	1.00	-	-	-	-	-	-	0.75	2.00	202
Common		10 Crack of Deck	0.75	-	-	-	-	-	-	0.03	2.00	202
Common		11 Delamination	0.03	-	-	-	-	-	-	0.03	-	202
Common		16 Others	0.00	-	-	-	-	-	-	0.03	-	202
Common		17 Reinforcing Material	0.25	-	-	-	-	-	-	0.03	-	202
Common		18 Abnormal Anchorage	0.25	-	-	-	-	-	-	0.03	-	202
Common		19 Discoloration of Materials	0.03	-	-	-	-	-	-	0.03	-	202
Common	Drainage System	1 Corrosion	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		4 Fracture	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		5 Deterioration of Paint	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		19 Discoloration of Materials	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		20 Water Leakage	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		21 Noise / Vibration	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		24 Debris	0.00	-	-	-	-	-	-	0.00	0.00	103
Common	Exp. Joints (Steel)	1 Corrosion	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		2 Crack in Steel	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		3 Loose Bolts	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		4 Fracture	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		5 Deterioration of Paint	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		12 Abnormal Spacing	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		20 Water Leakage	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		21 Noise / Vibration	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		24 Debris	0.00	-	-	-	-	-	-	0.00	0.00	103
Common	Inspection Facility	1 Corrosion	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		2 Crack in Steel	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		3 Loose Bolts	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		4 Fracture	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		5 Deterioration of Paint	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		20 Water Leakage	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		21 Noise / Vibration	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		24 Debris	0.00	-	-	-	-	-	-	0.00	0.00	103
Common	Lighting facility	1 Corrosion	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		2 Crack in Steel	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		3 Loose Bolts	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		4 Fracture	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		5 Deterioration of Paint	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		16 Others	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		19 Discoloration of Materials	0.00	-	-	-	-	-	-	0.00	0.00	103
Common		23 Deformation	0.00	-	-	-	-	-	-	0.00	0.00	103

Concrete Box	Main Gender	Common	Utility Pipe	1 Corrosion	0.00
		6 Crack	0.33	205 Crack in Steel	0.00
	Spalling / Exposed	7 Spalling / Exposed	0.67	3 Loose Bolts	0.00
		8 Water Leakage	0.17	4 Fracture	0.00
	Delamination	11 Delamination	0.17	5 Deterioration of Paint	0.00
		12 Abnormal Spacing	0.17	16 Others	0.00
	Others	18 Others	0.00	19 Discoloration of Materials	0.00
		17 Reinforcing Material	0.30	23 Deformation	0.00
	Abnormal Anchorage	18 Abnormal Anchorage	0.67		
		19 Discoloration of Materials	0.03		
	Noise / Vibration	21 Noise / Vibration	0.50		
		22 Abnormal Deflection	0.30		
	Deformation	23 Abnormal Deflection	0.03		
	Pavement	15 Disorder of Bearing	0.75	6 Crack	0.00
		7 Spalling / Exposed	0.33	7 Spalling / Exposed	0.00
	Common	8 Water Leakage	0.67	8 Water Leakage	0.00
		11 Delamination	0.17	9 Delamination	0.00
	Pier	15 Disorder of Bearing	0.17	10 Others	0.00
		13 Difference in Level	0.00	11 Abnormal Anchorage	0.00
	Common	14 Abnormal Pavement	0.00	12 Deformation	0.00
		16 Others	0.00		
	Railing (concrete)	16 Debris	0.00		
	Railing (steel)	6 Crack	0.43	6 Crack	0.00
		7 Spalling / Exposed	0.57	7 Spalling / Exposed	0.00
	Common	8 Water Leakage	0.29	8 Water Leakage	0.00
		11 Delamination	0.14	9 Delamination	0.00
	Retaining wall	16 Others	0.00	10 Others	0.00
		17 Reinforcing Material	0.57	11 Abnormal Anchorage	0.00
	Road Sign	19 Discoloration of Materials	0.14	12 Deformation	0.00
		20 Water Leakage	0.14	13 Settlement	0.00
	Common	21 Deformation	0.14	14 Scouring	0.00

Bridge Type : RC Girder Bridge		(same as PC Girder Bridge)				BMS Defects Coefficient Setting			
Element		Defect Type	Defect Coefficient:	Quantity coefficient	No. of Rule	Ct.	Dt.	Ct.	Dt.
Common	Abutment	6 Crack	0.43	5.00	101	101			
		7 Spalling / Exposed	0.57	5.00	101	101			
		8 Water Leakage	0.29						
		11 Delamination	0.14						
		16 Others	0.00						
		17 Reinforcing Material	0.57						
		19 Discoloration of Materials	0.14						
		20 Water Leakage	0.14						
		23 Deformation	0.14						
Common	Bearing (rubber)	1 Corrosion	0.25	1.00	101	101			
		2 Crack in Steel	1.00	—	1.00	—			
		3 Loose Bolts	0.50						
		4 Fracture	1.00	—	1.00	—			
		5 Deterioration of Paint	0.25	—	1.00	—			
		15 Disorder of Bearing	1.00	—	1.00	—			
		16 Others	0.00						
		20 Water Leakage	0.25						
		23 Deformation	0.13						
		24 Debris	0.13						
		25 Settlement	0.88						
Common	Bearing (steel)	1 Corrosion	0.25	1.00	101	101			
		2 Crack in Steel	1.00	—	1.00	—			
		3 Loose Bolts	0.50						
		4 Fracture	1.00	—	1.00	—			
		5 Deterioration of Paint	0.25	1.00	—	101			
		15 Disorder of Bearing	0.75	—	1.00	—			
		16 Others	0.00						
		20 Water Leakage	0.25						
		23 Deformation	0.25						
		24 Debris	0.25						
		25 Settlement	0.50						
Common	Beaming seat	6 Crack	0.14	—	0.25	—	101		
		11 Delamination	0.29	0.25	0.25	0.25	101		
		16 Others	0.00	0.00	0.00	0.00	101		
		23 Deformation	1.00	0.25	0.25	0.25	101		
Common	Bridge Approach	13 Difference in Level	0.00						
		14 Abnormal Pavement	0.00						
		16 Others	0.00						
		24 Debris	0.00						
Concrete Girder	Cross beam	6 Crack	0.40	2.00	201	203			
		7 Spalling / Exposed	0.60	0.01	—	201			
		8 Water Leakage	0.40						
		11 Delamination	0.20						
		16 Others	0.00						
		17 Reinforcing Material	0.40						
		18 Abnormal Anchorage	0.80						
		19 Discoloration of Materials	0.05						
		21 Noise / Vibration	1.00						
		23 Deformation	0.05						
Common	Curb	6 Crack	0.00						
		7 Spalling / Exposed	0.00						
		8 Water Leakage	0.00						
		11 Delamination	0.00						
		16 Others	0.00						
		18 Abnormal Anchorage	0.00						
		23 Deformation	0.00						
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10					0.05	—
		8 Water Leakage	0.10					1.00	—
		9 Fallen out of Deck	1.00					2.00	1.00
		10 Crack of Deck	0.75					0.03	—
		11 Delamination	0.03					0.03	—
		16 Others	0.00					0.25	—
		17 Reinforcing Material	0.25					0.25	—
		18 Abnormal Anchorage	0.25					0.03	—
		19 Discoloration of Materials	0.03					0.03	—
Common	Drainage System	1 Corrosion	0.00						
		4 Fracture	0.00						
		5 Deterioration of Paint	0.00						
		16 Others	0.00						
		19 Discoloration of Materials	0.00						
		20 Water Leakage	0.00						
		23 Deformation	0.00						
Common	Exp. Joints (Rubber)	12 Abnormal Spacing	0.00					1.00	—
		13 Difference in Level	0.00					1.00	—
		16 Others	0.00					1.00	—
		20 Water Leakage	0.00					1.00	—
		21 Noise / Vibration	0.00					1.00	—
		23 Deformation	0.00					1.00	—
		24 Debris	0.00						
Common	Exp. Joints (Steel)	1 Corrosion	0.00					1.00	—
		2 Crack in Steel	0.00						
		3 Loose Bolts	0.00						
		4 Fracture	0.00						
		5 Deterioration of Paint	0.00						
		12 Abnormal Spacing	0.00						
		13 Difference in Level	0.00						
		16 Others	0.00						
		20 Water Leakage	0.00						
		21 Noise / Vibration	0.00						
		23 Deformation	0.00						
		24 Debris	0.00						
Common	Foundation	16 Others	0.00					1.00	—
		25 Settlement	0.25					150	150
		26 Scouring	1.00					150	150
Common	Inspection Facility	1 Corrosion	0.00						
		2 Crack in Steel	0.00						
		3 Loose Bolts	0.00						
		4 Fracture	0.00						
		5 Deterioration of Paint	0.00						
		16 Others	0.00						
		20 Water Leakage	0.00						
		21 Noise / Vibration	0.00						
		23 Deformation	0.00						
Common	Lighting facility	1 Corrosion	0.00						
		2 Crack in Steel	0.00						
		3 Loose Bolts	0.00						
		4 Fracture	0.00						
		5 Deterioration of Paint	0.00						
		16 Others	0.00						
		19 Discoloration of Materials	0.00						
		23 Deformation	0.00						

Bridge Type : Rigid Frame Bridge	Element	Defect Type		Defect Coefficient:		BMS Defects Coefficient Setting		Quantity coefficient No. of Rule	Ct.	Dt.	Ct.	Dt.
		Ct.	Dt.	Ct.	Dt.	Ct.	Dt.					
Common	Abutment	6	Crack	0.43	5.00	5.00	101	101	-	-	-	-
Common	Abutment	7	Spalling / Exposed	0.57	5.00	-	101	-	1.00	-	1.00	-
Common	Bearing (rubber)	8	Water Leakage	0.29	-	-	-	-	1.00	-	1.00	-
Common	Bearing (rubber)	11	Delamination	0.14	-	-	-	-	0.75	2.00	0.75	2.00
Common	Bearing (rubber)	16	Others	0.00	-	-	-	-	0.03	-	0.03	-
Common	Bearing (steel)	17	Reinforcing Material	0.57	-	-	-	-	0.00	-	0.00	-
Common	Bearing (steel)	19	Discoloration of Materials	0.14	-	-	-	-	0.25	0.25	0.25	0.25
Common	Bearing (steel)	20	Water Leakage	0.14	-	-	-	-	0.00	-	0.00	-
Common	Bearing (steel)	23	Deformation	0.14	-	-	-	-	0.00	-	0.00	-
Common	Bearing seat	1	Corrosion	0.25	1.00	1.00	101	101	-	-	-	-
Common	Bearing seat	2	Crack in Steel	1.00	-	1.00	-	-	1.00	1.00	1.00	1.00
Common	Bearing seat	3	Loose Bolts	0.50	-	1.00	-	-	0.00	-	0.00	-
Common	Bearing seat	4	Fracture	1.00	-	1.00	-	-	0.00	-	0.00	-
Common	Bearing seat	5	Deterioration of Paint	0.25	-	1.00	-	-	0.00	-	0.00	-
Common	Bearing seat	15	Disorder of Bearing	1.00	-	1.00	-	-	0.00	-	0.00	-
Common	Bearing seat	16	Others	0.00	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Approach	20	Water Leakage	0.25	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Approach	23	Deformation	0.13	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Approach	24	Debris	0.13	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Approach	25	Settlement	0.88	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Girder	1	Corrosion	0.25	1.00	1.00	101	101	-	-	-	-
Common	Bridge Girder	2	Crack in Steel	1.00	-	1.00	-	-	1.00	1.00	1.00	1.00
Common	Bridge Girder	3	Loose Bolts	0.50	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Girder	4	Fracture	1.00	-	1.00	-	-	1.00	1.00	1.00	1.00
Common	Bridge Girder	5	Deterioration of Paint	0.25	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Girder	15	Disorder of Bearing	0.75	-	1.00	-	-	0.00	-	0.00	-
Common	Bridge Girder	16	Others	0.00	-	1.00	-	-	0.00	-	0.00	-
Common	Curb	20	Water Leakage	0.25	-	1.00	-	-	0.00	-	0.00	-
Common	Curb	21	Deformation	0.25	-	1.00	-	-	0.00	-	0.00	-
Common	Curb	22	Debris	0.50	-	1.00	-	-	0.00	-	0.00	-
Common	Curb	23	Settlement	0.50	-	1.00	-	-	0.00	-	0.00	-
Common	Curb	6	Crack	0.14	-	0.25	-	-	1.00	-	1.00	-
Common	Curb	11	Delamination	0.29	0.25	0.25	101	101	-	-	-	-
Common	Curb	16	Others	0.00	0.25	0.25	101	101	-	-	-	-
Common	Curb	23	Deformation	1.00	-	0.25	-	-	1.00	-	1.00	-
Common	Cross beam	13	Difference in Level	0.00	-	-	-	-	-	-	-	-
Common	Cross beam	14	Abnormal Pavement	0.00	-	-	-	-	-	-	-	-
Common	Cross beam	16	Others	0.00	-	-	-	-	-	-	-	-
Common	Cross beam	24	Debris	0.00	-	-	-	-	-	-	-	-
Common	Deck Slab (concrete)	7	Spalling / Exposed	0.60	2.00	2.00	201	203	-	-	-	-
Common	Deck Slab (concrete)	8	Water Leakage	0.40	0.01	-	201	-	-	-	-	-
Common	Deck Slab (concrete)	11	Delamination	0.20	-	-	-	-	-	-	-	-
Common	Deck Slab (concrete)	16	Others	0.00	-	-	-	-	-	-	-	-
Common	Deck Slab (concrete)	17	Reinforcing Material	0.40	-	-	-	-	-	-	-	-
Common	Deck Slab (concrete)	18	Abnormal Anchorage	0.80	-	-	-	-	-	-	-	-
Common	Deck Slab (concrete)	19	Discoloration of Materials	0.05	-	-	-	-	-	-	-	-
Common	Deck Slab (concrete)	21	Noise / Vibration	1.00	-	-	-	-	-	-	-	-
Common	Deck Slab (concrete)	23	Deformation	0.05	-	-	-	-	-	-	-	-
Common	Drainage System	1	Corrosion	0.00	-	-	-	-	-	-	-	-
Common	Drainage System	4	Fracture	0.00	-	-	-	-	-	-	-	-
Common	Drainage System	5	Deterioration of Paint	0.00	-	-	-	-	-	-	-	-
Common	Drainage System	16	Others	0.00	-	-	-	-	-	-	-	-
Common	Drainage System	19	Discoloration of Materials	0.03	-	-	-	-	-	-	-	-
Common	Drainage System	20	Water Leakage	0.00	-	-	-	-	-	-	-	-
Common	Drainage System	21	Noise / Vibration	0.00	-	-	-	-	-	-	-	-
Common	Drainage System	23	Deformation	0.00	-	-	-	-	-	-	-	-
Common	Drainage System	24	Debris	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	1	Corrosion	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	2	Crack in Steel	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	3	Loose Bolts	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	4	Fracture	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	5	Deterioration of Paint	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	12	Abnormal Spacing	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	13	Difference in Level	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	16	Others	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	20	Water Leakage	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	21	Noise / Vibration	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	23	Deformation	0.00	-	-	-	-	-	-	-	-
Common	Exp. Joints (Steel)	24	Debris	0.00	-	-	-	-	-	-	-	-
Common	Foundation	16	Others	0.00	-	-	-	-	-	-	-	-
Common	Foundation	25	Settlement	0.25	-	-	-	-	-	-	-	-
Common	Foundation	26	Scouring	1.00	-	-	-	-	-	-	-	-
Common	Foundation	160	150	150	-	-	-	-	-	-	-	-
Common	Foundation	160	150	150	-	-	-	-	-	-	-	-
Common	Inspection Facility	1	Corrosion	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	2	Crack in Steel	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	3	Loose Bolts	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	4	Fracture	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	5	Deterioration of Paint	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	16	Others	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	20	Water Leakage	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	21	Noise / Vibration	0.00	-	-	-	-	-	-	-	-
Common	Inspection Facility	23	Deformation	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	1	Corrosion	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	2	Crack in Steel	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	3	Loose Bolts	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	4	Fracture	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	5	Deterioration of Paint	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	16	Others	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	19	Discoloration of Materials	0.00	-	-	-	-	-	-	-	-
Common	Lighting facility	23	Deformation	0.00	-	-	-	-	-	-	-	-

Bridge Type : Small Slab Bridge		Element		Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting		Quantity coefficient		No. of Rule	Ct.	Dt.	Common		Exp. Joints (Steel)		1	Corrosion	0.00	1.00	1.00	103	103
																	2	Crack in Steel	0.00	1.00	1.00	103	103
																	3	Loose Bolts	0.00	1.00	1.00	103	103
																	4	Fracture	0.00	1.00	1.00	103	103
																	5	Deterioration of Paint	0.00	1.00	1.00	103	103
Common		Abutment		6	Crack	0.43	5.00	5.00		101	101	101					12	Abnormal Spacing	0.00	1.00	1.00	103	103
				7	Spalling / Exposed	0.57	5.00	-		101	-	-					13	Difference in Level	0.00	1.00	1.00	103	103
				8	Water Leakage	0.29											16	Others	0.00				
				11	Delamination	0.14											20	Water Leakage	0.00				
				16	Others	0.00											21	Noise / Vibration	0.00				
				17	Reinforcing Material	0.57											23	Deformation	0.00				
				19	Discoloration of Materials	0.14											24	Debris	0.00				
				20	Water Leakkage	0.14																	
				23	Deformation	0.14																	
				24	Debris	0.00																	
Common		Bridge Approach		13	Difference in Level	0.00											16	Others	0.00				
				14	Abnormal Pavement	0.00											25	Settlement	0.25				
				16	Others	0.00											26	Scouring	1.00				
				24	Debris	0.00																	
				6	Crack	0.40	2.00	2.00		203	-	-					2	Crack in Steel	0.00				
				7	Spalling / Exposed	0.60	0.01	-		201	-	-					3	Loose Bolts	0.00				
				8	Water Leakage	0.40											4	Fracture	0.00				
				11	Delamination	0.20											5	Deterioration of Paint	0.00				
				16	Others	0.00											16	Others	0.00				
				17	Reinforcing Material	0.40											20	Water Leakage	0.00				
Common		Curb		18	Abnormal Anchorage	0.00											21	Noise / Vibration	0.00				
				19	Discoloration of Materials	0.05											23	Deformation	0.00				
				21	Noise / Vibration	1.00																	
				23	Deformation	0.05																	
				6	Crack	0.00											6	Crack	0.33				
				7	Spalling / Exposed	0.00											7	Spalling / Exposed	0.67				
				8	Water Leakage	0.00											8	Water Leakage	0.17				
				11	Delamination	0.00											11	Delamination	0.17				
				16	Others	0.00											16	Others	0.00				
Common		Deck Slab (concrete)		18	Abnormal Anchorage	0.00											17	Reinforcing Material	0.30				
				19	Discoloration of Materials	0.00											18	Abnormal Anchorage	0.67				
				20	Water Leakage	0.25											19	Discoloration of Materials	0.03				
				21	Others	0.00											21	Noise / Vibration	0.50				
				22	Abnormal Anchorage	0.25											22	Abnormal Anchorage	0.30				
				23	Deformation	0.03											23	Deformation	0.03				
				24	Debris	0.00																	
Common		Drainage System		1	Corrosion	0.00											15	Disorder of Bearing	0.75				
				4	Fracture	0.00											6	Crack	0.33				
				5	Deterioration of Paint	0.00											7	Spalling / Exposed	0.67				
				16	Others	0.00											8	Water Leakage	0.17				
				19	Discoloration of Materials	0.00											11	Delamination	0.17				
				20	Water Leakage	0.00											16	Others	0.00				
				21	Noise / Vibration	0.00											17	Reinforcing Material	0.57				
				22	Deformation	0.00											19	Discoloration of Materials	0.14				
				23	Debris	0.00											20	Water Leakage	0.14				
				24	Debris	0.00											23	Deformation	0.14				
Common		Exp. Joints (Rubber)		12	Abnormal Spacing	0.00	1.00	1.00		103	103	103					6	Crack	0.43	10.00	10.00	101	101
				13	Difference in Level	0.00	1.00	1.00		103	103	103					7	Spalling / Exposed	0.57	10.00	10.00	101	101
				16	Others	0.00											8	Water Leakage	0.29				
				20	Water Leakage	0.00											11	Delamination	0.14				

Bridge Type : Steel Arch Bridge	Element	Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting		Quantity coefficient Ct.	No. of Rule Dt.
				Ct.	Dt.		
Common	Abutment	6 Crack	0.43	5.00	5.00	101	101
		7 Spalling / Exposed	0.57	5.00	-	101	-
		8 Water Leakage	0.29				
		11 Delamination	0.14				
		16 Others	0.00				
		17 Reinforcing Material	0.57				
		19 Discoloration of Materials	0.14				
		20 Water Leakage	0.14				
		23 Deformation	0.14				
Common	Bearing (rubber)	1 Corrosion	0.25	1.00	1.00	101	101
		2 Crack in Steel	1.00	-	1.00	-	101
		3 Loose Bolts	0.50				
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.25				
		15 Disorder of Bearing	1.00	-	1.00	-	101
		16 Others	0.00				
		20 Water Leakage	0.25				
		23 Deformation	0.13				
		24 Debris	0.13				
		25 Settlement	0.88				
Common	Bearing (steel)	1 Corrosion	0.25	1.00	1.00	101	101
		2 Crack in Steel	1.00	-	1.00	-	101
		3 Loose Bolts	0.50				
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.25				
		15 Disorder of Bearing	0.75	-	1.00	-	101
		16 Others	0.00				
		20 Water Leakage	0.25				
		23 Deformation	0.25				
		24 Debris	0.25				
		25 Settlement	0.50				
Common	Beading seat	6 Crack	0.14	-	0.25	-	101
		11 Delamination	0.29	0.25	0.25	101	101
		16 Others	0.00				
		23 Deformation	1.00	0.25	0.25	101	101
Common	Bridge Approach	13 Difference in Level	0.00				
		14 Abnormal Pavement	0.00				
		16 Others	0.00				
		24 Debris	0.00				
Portable Steel Truss Steel Arch	Cross beam	1 Corrosion	0.33	3.00	3.00	101	101
		2 Crack in Steel	1.00	1.00	1.00	101	101
		3 Loose Bolts	0.17				
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.17	1.40	-	201	-
		16 Others	0.00				
		21 Noise / Vibration	0.33				
		23 Deformation	0.17				
Common	Curb	6 Crack	0.00				
		7 Spalling / Exposed	0.00				
		8 Water Leakage	0.00				
		11 Delamination	0.00				
		16 Others	0.00				
		18 Abnormal Anchorage	0.00				
		23 Deformation	0.00				

Bridge Type : Steel Arch Bridge	Element	Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting		Quantity coefficient Ct.	No. of Rule Dt.
				Ct.	Dt.		
Common	Deck Slab (steel)	1 Corrosion	0.50				
		2 Crack in Steel	1.00				
		3 Loose Bolts	0.17				
		4 Fracture	1.00				
		5 Deterioration of Paint	0.17				
		16 Others	0.00				
		21 Noise / Vibration	0.17				
		23 Deformation	0.17				
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10				
		8 Water Leakage	0.10				
		9 Fallen out of Deck	1.00				
		10 Crack of Deck	0.75				
		11 Delamination	0.03				
		16 Others	0.00				
		17 Reinforcing Material	0.25				
		18 Abnormal Anchorage	0.25				
		19 Discoloration of Materials	0.03				
Common	Drainage System	1 Corrosion	0.00				
		4 Fracture	0.00				
		5 Deterioration of Paint	0.00				
		16 Others	0.00				
		19 Discoloration of Materials	0.00				
		20 Water Leakage	0.00				
		23 Deformation	0.00				
		24 Debris	0.00				
Common	Exp. Joints (Rubber)	12 Abnormal Spacing	0.00				
		13 Difference in Level	0.00				
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
		23 Deformation	0.00				
Common	Exp. Joints (Steel)	1 Corrosion	0.00				
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00				
		5 Deterioration of Paint	0.00				
		12 Abnormal Spacing	0.00				
		13 Difference in Level	0.00				
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
		23 Deformation	0.00				
		24 Debris	0.00				
Common	Foundation	1 Corrosion	0.00				
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00				
		5 Deterioration of Paint	0.00				
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
		23 Deformation	0.00				
Common	Inspection Facility	1 Corrosion	0.00				
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00				
		5 Deterioration of Paint	0.00				
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
		23 Deformation	0.00				

Steel	Lateral Bracing	Common	Retaining wall	6	Crack	0.00		5.00	5.00	101	101
		2	Crack in Steel	0.00	3.00	3.00	201	201	101	101	-
		3	Loose Bolts	0.00	1.00	1.00	101	101			
		4	Fracture	0.00	-	1.00	-	-	101		
		5	Deterioration of Paint	0.00	0.40	-	102	-			
		16	Others	0.00							
		17	Reinforcing Material	0.00							
		23	Deformation	0.00							
		1	Corrosion	0.00							
		2	Crack in Steel	0.00							
Common	Lighting facility	3	Loose Bolts	0.00							
		4	Fracture	0.00							
		5	Deterioration of Paint	0.00							
		16	Others	0.00							
		19	Discoloration of Materials	0.00							
		23	Deformation	0.00							
		1	Corrosion	0.00							
		2	Crack in Steel	0.00							
		3	Loose Bolts	0.00							
		4	Fracture	0.00							
Steel Arch	Main Arch	5	Deterioration of Paint	0.20	1.00	-	101	-			
		12	Abnormal Spacing	0.20	1.00	-	206	-			
		16	Others	0.00							
		17	Reinforcing Material	0.20							
		20	Water Leakage	0.20							
		21	Noise / Vibration	0.20							
		22	Abnormal Deflection	0.20							
		23	Deformation	0.20							
		1	Corrosion	0.60	3.00	209	209	101	101		
		2	Crack in Steel	1.00	1.00						
Common	Pavement	3	Loose Bolts	0.20							
		4	Fracture	1.00	-	1.00	-	101	-		
		5	Deterioration of Paint	0.20	1.00	-	206	-			
		11	Discoloration	0.17							
		15	Disorder of Bearing	0.75	1.00		101	101			
		13	Difference in Level	0.00	1.00		101	101			
		14	Abnormal Pavement	0.00	1.00	-	104	-			
		16	Others	0.00							
		24	Debris	0.00							
		1	Corrosion	0.75	1.00		101	101			
Common	Pier	6	Crack	0.33							
		7	Spalling / Exposed	0.87							
		8	Water Leakage	0.17							
		11	Delamination	0.17							
		15	Disorder of Bearing	0.75	1.00		101	101			
		13	Difference in Level	0.00	1.00	-	104	-			
		14	Abnormal Pavement	0.00	1.00	-					
		16	Others	0.00							
		23	Deformation	0.14							
		6	Crack	0.43	10.00	10.00	101	101			
Common	Railing (concrete)	7	Spalling / Exposed	0.57	10.00	-	101	-			
		8	Water Leakage	0.29							
		11	Delamination	0.14							
		16	Others	0.00							
		18	Abnormal Anchorage	0.00		-	100	-			
		23	Deformation	0.00		-					
		1	Corrosion	0.00							
		2	Crack in Steel	0.00							
		3	Loose Bolts	0.00							
		4	Fracture	0.00							
Common	Railing (steel)	5	Deterioration of Paint	0.00							
		16	Others	0.00		-	102	-			
		23	Deformation	0.00	-	1.00	-	102	-		
		1	Corrosion	0.00							
		2	Crack in Steel	0.00							
		3	Loose Bolts	0.00							
		4	Fracture	0.00							
		5	Deterioration of Paint	0.00							
		16	Others	0.00							
		23	Deformation	0.00	-	1.00	-	102	-		

Bridge Type :	Steel Box Girder Bridge	BMS Defects Coefficient Setting		Quantity coefficient No. of Rule	Ct.	Dt.
		Defect Type	Coefficient:			
Common	Abutment	6 Crack	0.43	5.00	101	101
		7 Spalling / Exposed	0.57	5.00	101	-
		8 Water Leakage	0.29			
		11 Delamination	0.14			
		16 Others	0.00			
		17 Reinforcing Material	0.57			
		19 Discoloration of Materials	0.14			
		20 Water Leakage	0.14			
		23 Deformation	0.14			
Common	Bearing (rubber)	1 Corrosion	0.25	1.00	101	101
		2 Crack in Steel	1.00	-	101	-
		3 Loose Bolts	0.50			
		4 Fracture	1.00	-	101	-
		5 Deterioration of Paint	0.25			
		15 Disorder of Bearing	1.00	-	101	-
		16 Others	0.00			
		20 Water Leakage	0.25			
		23 Deformation	0.13			
		24 Debris	0.13			
		25 Settlement	0.88			
Common	Bearing (steel)	1 Corrosion	0.25	1.00	101	101
		2 Crack in Steel	1.00	-	101	-
		3 Loose Bolts	0.50			
		4 Fracture	1.00	-	101	-
		5 Deterioration of Paint	0.25			
		15 Disorder of Bearing	0.75	-	101	-
		16 Others	0.00			
		20 Water Leakage	0.25			
		23 Deformation	0.25			
		24 Debris	0.25			
		25 Settlement	0.50			
Common	Beading seat	6 Crack	0.14	-	101	101
		11 Delamination	0.29	0.25	101	101
		16 Others	0.00	0.25	101	101
		23 Deformation	1.00			
Common	Bridge Approach	13 Difference in Level	0.00			
		14 Abnormal Pavement	0.00			
		16 Others	0.00			
		24 Debris	0.00			
Steel Girder	Cross beam	1 Corrosion	0.33	1.50	203	203
		2 Crack in Steel	1.00	1.00	101	101
		3 Loose Bolts	0.17			
		4 Fracture	1.00	-	101	-
		5 Deterioration of Paint	0.17	1.50	-	203
		16 Others	0.00			
		21 Noise / Vibration	0.33			
		23 Deformation	0.17			
Common	Curb	6 Crack	0.00			
		7 Spalling / Exposed	0.00			
		8 Water Leakage	0.00			
		11 Delamination	0.00			
		16 Others	0.00			
		18 Abnormal Anchorage	0.00			
		23 Deformation	0.00			

Bridge Type :	Element	BMS Defects Coefficient Setting		Quantity coefficient No. of Rule	Ct.	Dt.
		Defect Type	Coefficient:			
Common	Deck Slab (steel)	1 Corrosion	0.50			
		2 Crack in Steel	1.00			
		3 Loose Bolts	0.17			
		4 Fracture	1.00			
		5 Deterioration of Paint	0.17			
		16 Others	0.00			
		21 Noise / Vibration	0.17			
		23 Deformation	0.17			
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10			
		8 Water Leakage	0.10			
		9 Fallen out of Deck	1.00			
		10 Crack of Deck	0.75			
		11 Delamination	0.03			
		16 Others	0.00			
		17 Reinforcing Material	0.25			
		18 Abnormal Anchorage	0.25			
		19 Discoloration of Materials	0.03			
Common	Drainage System	1 Corrosion	0.00			
		4 Fracture	0.00			
		5 Deterioration of Paint	0.00			
		16 Others	0.00			
		19 Discoloration of Materials	0.00			
		20 Water Leakage	0.00			
		23 Deformation	0.00			
		24 Debris	0.00			
Common	Exp. Joints (Rubber)	12 Abnormal Spacing	0.00			
		13 Difference in Level	0.00			
		16 Others	0.00			
		20 Water Leakage	0.00			
		21 Noise / Vibration	0.00			
		23 Deformation	0.00			
Common	Exp. Joints (Steel)	1 Corrosion	0.00			
		2 Crack in Steel	0.00			
		3 Loose Bolts	0.00			
		4 Fracture	0.00			
		5 Deterioration of Paint	0.00			
		12 Abnormal Spacing	0.00			
		13 Difference in Level	0.00			
		16 Others	0.00			
		20 Water Leakage	0.00			
		21 Noise / Vibration	0.00			
		23 Deformation	0.00			
		24 Debris	0.00			
Common	Foundation	1 Corrosion	0.00			
		2 Crack in Steel	0.00			
		3 Loose Bolts	0.00			
		4 Fracture	0.00			
		5 Deterioration of Paint	0.00			
		16 Others	0.00			
		25 Settlement	0.25			
		26 Scouring	1.00			
Common	Inspection Facility	1 Corrosion	0.00			
		2 Crack in Steel	0.00			
		3 Loose Bolts	0.00			
		4 Fracture	0.00			
		5 Deterioration of Paint	0.00			
		16 Others	0.00			
		20 Water Leakage	0.00			
		21 Noise / Vibration	0.00			
		23 Deformation	0.00			
		24 Debris	0.00			

Steel	Lateral Bracing	Common	Retaining wall	6	Crack	0.00		5.00	5.00	101	101
		2	Crack in Steel	0.00	3.00	3.00	201	201	101	101	-
		3	Loose Bolts	0.00	1.00	1.00	101	101	101	101	-
		4	Fracture	0.00	-	1.00	-	-	101	101	-
		5	Deterioration of Paint	0.00	0.40	-	102	-	102	-	-
		16	Others	0.00							
		17	Reinforcing Material	0.00							
		23	Deformation	0.00							
		1	Corrosion	0.00							
		2	Crack in Steel	0.00							
Common	Lighting facility	3	Loose Bolts	0.00							
		4	Fracture	0.00							
		5	Deterioration of Paint	0.00							
		16	Others	0.00							
		19	Discoloration of Materials	0.00							
		23	Deformation	0.00							
		1	Corrosion	0.60	3.00	209	209	209	209	209	209
		2	Crack in Steel	1.00	1.00	101	101	101	101	101	101
		3	Loose Bolts	0.20							
		4	Fracture	1.00	-	1.00	-	101	-	101	-
Steel Box	Main Girder	5	Deterioration of Paint	0.20	1.00	-	206	-	206	-	-
		12	Abnormal Spacing	0.20							
		16	Others	0.00							
		17	Reinforcing Material	0.20							
		20	Water Leakage	0.20							
		21	Noise / Vibration	0.20							
		22	Abnormal Deflection	0.20							
		23	Deformation	0.20							
		15	Disorder of Bearing	0.75	1.00	1.00	101	101	101	101	-
		6	Crack	0.33							
Common	Pavement	7	Spalling / Exposed	0.87							
		8	Water Leakage	0.17							
		11	Delamination	0.17							
		15	Disorder of Bearing	0.75	1.00	1.00	101	101	101	101	-
		13	Difference in Level	0.00	1.00	-	104	-	104	-	-
		14	Abnormal Pavement	0.00	1.00	-	104	-	104	-	-
		16	Others	0.00							
		24	Debris	0.00							
		1	Corrosion	0.75	1.00	1.00	101	101	101	101	-
		2	Crack in Steel	0.33							
Common	Pier	3	Loose Bolts	0.00							
		4	Fracture	0.00							
		5	Deterioration of Paint	0.00							
		16	Others	0.00							
		17	Reinforcing Material	0.57							
		19	Discoloration of Materials	0.14							
		20	Water Leakage	0.14							
		23	Deformation	0.14							
		6	Crack	0.43	10.00	10.00	101	101	101	101	-
		7	Spalling / Exposed	0.57	10.00	-	101	-	101	-	-
Common	Railing (concrete)	8	Water Leakage	0.29							
		11	Delamination	0.14							
		16	Others	0.00							
		18	Abnormal Anchorage	0.00	0.00	-	1.00	-	1.00	-	-
		23	Deformation	0.00	-						
		1	Corrosion	0.00							
		2	Crack in Steel	0.00							
		3	Loose Bolts	0.00							
		4	Fracture	0.00							
		5	Deterioration of Paint	0.00							
Common	Railing (steel)	16	Others	0.00	0.00	-	1.00	-	1.00	-	-
		18	Abnormal Anchorage	0.00	0.00	-	1.00	-	1.00	-	-
		23	Deformation	0.00	-						
		1	Corrosion	0.00							
		2	Crack in Steel	0.00							
		3	Loose Bolts	0.00							
		4	Fracture	0.00							
		5	Deterioration of Paint	0.00							
		16	Others	0.00	0.00	-	1.00	-	1.00	-	-
		23	Deformation	0.00	-						

Bridge Type : Steel Girder Bridge	Element	Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting		Quantity coefficient Ct.	No. of Rule Dt.
				Ct.	Dt.		
Common	Abutment	6 Crack	0.43	5.00	5.00	101	101
		7 Spalling / Exposed	0.57	5.00	-	101	-
		8 Water Leakage	0.29				
		11 Delamination	0.14				
		16 Others	0.00				
	Bearing (rubber)	17 Reinforcing Material	0.57				
		19 Discoloration of Materials	0.14				
		20 Water Leakage	0.14				
		23 Deformation	0.14				
		1 Corrosion	0.25	1.00	1.00	101	101
Common	Bearing (steel)	2 Crack in Steel	1.00	-	1.00	-	101
		3 Loose Bolts	0.50	-	1.00	-	101
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.25	-	1.00	-	101
		15 Disorder of Bearing	1.00	-	1.00	-	101
		16 Others	0.00				
		20 Water Leakage	0.25				
		23 Deformation	0.13				
		24 Debris	0.13				
		25 Settlement	0.88				
Common	Bearing (steel)	1 Corrosion	0.25	1.00	1.00	101	101
		2 Crack in Steel	1.00	-	1.00	-	101
		3 Loose Bolts	0.50	-	1.00	-	101
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.25	-	1.00	-	101
		15 Disorder of Bearing	0.75	-	1.00	-	101
		16 Others	0.00				
		20 Water Leakage	0.25				
		23 Deformation	0.25				
		24 Debris	0.25				
Common	Beaming seat	25 Settlement	0.50				
		6 Crack	0.14	-	0.25	-	101
		11 Delamination	0.29	0.25	0.25	101	101
		16 Others	0.00	0.25	0.25	101	101
		23 Deformation	1.00				
	Bridge Approach	13 Difference in Level	0.00				
		14 Abnormal Pavement	0.00				
		16 Others	0.00				
		24 Debris	0.00				
		25 Settlement	0.50				
Steel Girder	Cross beam	1 Corrosion	0.33	1.50	203	203	
		2 Crack in Steel	1.00	1.00	101	101	
		3 Loose Bolts	0.17	-	1.00	-	101
		4 Fracture	1.00	-	1.50	-	203
		5 Deterioration of Paint	0.17	-	1.00	-	101
		16 Others	0.00				
		21 Noise / Vibration	0.33				
		23 Deformation	0.17				
		25 Settlement	0.25				
		26 Scouring	1.00				
Common	Curb	1 Corrosion	0.00				
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00				
		5 Deterioration of Paint	0.00				
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
		23 Deformation	0.00				
		25 Settlement	0.25				
Common	Inspection Facility	1 Corrosion	0.00				
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00				
		5 Deterioration of Paint	0.00				
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
		23 Deformation	0.00				
		25 Settlement	0.25				

Bridge Type : Steel Girder Bridge	Element	Defect Type	Defect Coefficient:	BMS Defects Coefficient Setting	Quantity coefficient Ct.	No. of Rule Dt.
Common	Beaming seat	6 Crack	0.43	5.00	5.00	101
Common	Bridge Approach	13 Difference in Level	0.00			
Common	Cross beam	1 Corrosion	0.33	1.50	203	203
Steel Girder	Curb	1 Corrosion	0.00			
Common	Cross beam	2 Crack in Steel	1.00	1.00	101	101
Common	Curb	3 Loose Bolts	0.17	-	1.00	-
Common	Curb	4 Fracture	1.00	-	1.50	-
Common	Curb	5 Deterioration of Paint	0.17	-	1.00	-
Common	Curb	16 Others	0.00			
Common	Curb	21 Noise / Vibration	0.33			
Common	Curb	23 Deformation	0.17			
Common	Foundation	16 Others	0.00			
Common	Foundation	25 Settlement	0.25			
Common	Foundation	26 Scouring	1.00			
Common	Inspection Facility	1 Corrosion	0.00			
Common	Inspection Facility	2 Crack in Steel	0.00			
Common	Inspection Facility	3 Loose Bolts	0.00			
Common	Inspection Facility	4 Fracture	0.00			
Common	Inspection Facility	5 Deterioration of Paint	0.00			
Common	Inspection Facility	16 Others	0.00			
Common	Inspection Facility	20 Water Leakage	0.00			
Common	Inspection Facility	21 Noise / Vibration	0.00			
Common	Inspection Facility	23 Deformation	0.00			

Steel		Lateral Bracing		1	Corrosion	0.00	3.00	201	201	7	Spalling / Exposed	0.57	10.00	-	101	-	
				2	Crack in Steel	0.00	1.00	101	101	8	Water Leakage	0.29					
				3	Loose Bolts	0.00				11	Delamination	0.14					
				4	Fracture	0.00	-	101	-	16	Others	0.00					
				5	Deterioration of Paint	0.00	0.40	-	102	17	Reinforcing Material	0.57					
				16	Others	0.00				19	Discoloration of Materials	0.14					
				17	Reinforcing Material	0.00				20	Water Leakage	0.14					
				23	Deformation	0.00				23	Deformation	0.14					
Common		Lighting facility		1	Corrosion	0.00				6	Crack	0.00					
				2	Crack in Steel	0.00				7	Spalling / Exposed	0.00					
				3	Loose Bolts	0.00				8	Water Leakage	0.00					
				4	Fracture	0.00				11	Delamination	0.00					
				5	Deterioration of Paint	0.00				16	Others	0.00					
				16	Others	0.00				18	Abnormal Anchorage	0.00					
				19	Discoloration of Materials	0.00				23	Deformation	0.00					
				23	Deformation	0.00							-	1.00	-	102	
Common		Railing (concrete)		Common	Railing (concrete)	0.00				6	Crack	0.00					
										7	Spalling / Exposed	0.00					
										8	Water Leakage	0.00					
										11	Delamination	0.00					
										16	Others	0.00					
										18	Abnormal Anchorage	0.00					
										23	Deformation	0.00					
													-	1.00	-	102	
Steel		Main Girder		Steel	Main Girder	0.60	3.00	209	209	1	Corrosion	0.00					
						2	Crack in Steel	1.00	1.00	101	2	Crack in Steel	0.00				
						3	Loose Bolts	0.20			3	Loose Bolts	0.00				
						4	Fracture	1.00	-		4	Fracture	0.00				
						5	Deterioration of Paint	0.20	1.00	-	5	Deterioration of Paint	0.00				
						12	Abnormal Spacing	0.20			16	Others	0.00				
						16	Others	0.00			23	Deformation	0.00				
						17	Reinforcing Material	0.20						-	1.00	-	102
						20	Water Leakage	0.20									
						21	Noise / Vibration	0.20									
						22	Abnormal Deflection	0.20									
						23	Deformation	0.20									
Steel		Main Girder Hinge		Steel	Main Girder Hinge	0.80	1.00	101	101	1	Corrosion	0.00					
						2	Crack in Steel	1.00			2	Crack in Steel	0.00				
						3	Loose Bolts	0.20			3	Loose Bolts	0.00				
						4	Fracture	1.00	-		4	Fracture	0.00				
						5	Deterioration of Paint	0.20			5	Deterioration of Paint	0.00				
						12	Abnormal Spacing	0.20			16	Others	0.00				
						15	Disorder of Bearing	0.75	1.00	101	101	101					
						16	Others	0.00									
						17	Reinforcing Material	0.20									
						20	Water Leakage	0.20									
						21	Noise / Vibration	0.20									
						22	Abnormal Deflection	0.20									
						23	Deformation	0.20									
Concrete		Main Girder Hinge		Concrete	Main Girder Hinge	0.60	1.00	101	101	1	Corrosion	0.00					
						2	Crack in Steel	1.00			2	Crack in Steel	0.00				
						3	Loose Bolts	0.20			3	Loose Bolts	0.00				
						4	Fracture	1.00	-		4	Fracture	0.00				
						5	Deterioration of Paint	0.20			5	Deterioration of Paint	0.00				
						6	Crack	0.33			6	Crack	0.33				
						7	Spalling / Exposed	0.67			7	Spalling / Exposed	0.67				
						8	Water Leakage	0.17			8	Water Leakage	0.17				
						11	Delamination	0.17			11	Delamination	0.17				
						12	Abnormal Spacing	0.20			12	Abnormal Spacing	0.20				
						15	Disorder of Bearing	0.75	1.00	101	101	101					
						16	Others	0.00			16	Others	0.00				
						17	Reinforcing Material	0.20			17	Reinforcing Material	0.20				
						20	Water Leakage	0.20			20	Water Leakage	0.20				
						21	Noise / Vibration	0.20			21	Noise / Vibration	0.20				
						22	Abnormal Deflection	0.20			22	Abnormal Deflection	0.20				
						23	Deformation	0.20			23	Deformation	0.20				
Common		Pavement		Common	Pavement	13	Difference in Level	0.00			13	Difference in Level	0.00				
						14	Abnormal Pavement	0.00			14	Abnormal Pavement	0.00				
						16	Others	0.00			16	Others	0.00				
						24	Debris	0.00			24	Debris	0.00				

		Bridge Type :	Truss Bridge	BMS Defects Coefficient Setting			
				Element	Defect Type	Defect Coefficient:	Quantity coefficient
		Common	Abutment	6	Crack	0.43	5.00
				7	Spalling / Exposed	0.57	5.00
		Common	Bearing (rubber)	8	Water Leakage	0.29	-
				9	Delamination	0.14	-
		Common	Bearing (steel)	10	Others	0.00	-
				11	Reinforcing Material	0.57	-
		Common	Bridge Approach	12	Discoloration of Materials	0.14	-
				13	Deformation	0.14	-
		Common	Cross beam	14	Settlement	0.14	-
				15	Scouring	0.14	-
		Common	Curb	16	Corrosion	0.00	-
				17	Crack in Steel	0.00	-
		Common	Bridge Approach	18	Loose Bolts	0.00	-
				19	Fracture	0.00	-
		Common	Cross beam	20	Deterioration of Paint	0.25	-
				21	Crack in Steel	1.00	-
		Common	Bridge Approach	22	Loose Bolts	0.50	-
				23	Fracture	1.00	-
		Common	Cross beam	24	Disorder of Paint	1.00	-
				25	Others	0.00	-
		Common	Bridge Approach	26	Water Leakage	0.25	-
				27	Deformation	0.13	-
		Common	Cross beam	28	Others	0.00	-
				29	Debris	0.13	-
		Common	Bridge Approach	30	Settlement	0.88	-
				31	Corrosion	0.25	-
		Common	Cross beam	32	Crack in Steel	1.00	-
				33	Loose Bolts	0.50	-
		Common	Bridge Approach	34	Fracture	1.00	-
				35	Deterioration of Paint	0.25	-
		Common	Cross beam	36	Disorder of Bearing	0.75	-
				37	Others	0.00	-
		Common	Bridge Approach	38	Water Leakage	0.25	-
				39	Deformation	0.25	-
		Common	Cross beam	40	Others	0.00	-
				41	Debris	0.25	-
		Common	Bridge Approach	42	Settlement	0.50	-
				43	Corrosion	0.25	-
		Common	Cross beam	44	Crack in Steel	1.00	-
				45	Loose Bolts	0.50	-
		Common	Bridge Approach	46	Fracture	1.00	-
				47	Deterioration of Paint	0.25	-
		Common	Cross beam	48	Disorder of Bearing	0.75	-
				49	Others	0.00	-
		Common	Bridge Approach	50	Water Leakage	0.25	-
				51	Deformation	0.25	-
		Common	Cross beam	52	Others	0.00	-
				53	Debris	0.25	-
		Common	Bridge Approach	54	Settlement	0.50	-
				55	Corrosion	0.25	-
		Common	Cross beam	56	Crack in Steel	1.00	-
				57	Loose Bolts	0.50	-
		Common	Bridge Approach	58	Fracture	1.00	-
				59	Deterioration of Paint	0.25	-
		Common	Cross beam	60	Disorder of Bearing	0.75	-
				61	Others	0.00	-
		Common	Bridge Approach	62	Water Leakage	0.25	-
				63	Deformation	0.25	-
		Common	Cross beam	64	Others	0.00	-
				65	Debris	0.25	-
		Common	Bridge Approach	66	Settlement	0.50	-
				67	Corrosion	0.25	-
		Common	Cross beam	68	Crack in Steel	1.00	-
				69	Loose Bolts	0.50	-
		Common	Bridge Approach	70	Fracture	1.00	-
				71	Deterioration of Paint	0.25	-
		Common	Cross beam	72	Disorder of Bearing	0.75	-
				73	Others	0.00	-
		Common	Bridge Approach	74	Water Leakage	0.25	-
				75	Deformation	0.25	-
		Common	Cross beam	76	Others	0.00	-
				77	Debris	0.25	-
		Common	Bridge Approach	78	Settlement	0.50	-
				79	Corrosion	0.25	-
		Common	Cross beam	80	Crack in Steel	1.00	-
				81	Loose Bolts	0.50	-
		Common	Bridge Approach	82	Fracture	1.00	-
				83	Deterioration of Paint	0.25	-
		Common	Cross beam	84	Disorder of Bearing	0.75	-
				85	Others	0.00	-
		Common	Bridge Approach	86	Water Leakage	0.25	-
				87	Deformation	0.25	-
		Common	Cross beam	88	Others	0.00	-
				89	Debris	0.25	-
		Common	Bridge Approach	90	Settlement	0.50	-
				91	Corrosion	0.25	-
		Common	Cross beam	92	Crack in Steel	1.00	-
				93	Loose Bolts	0.50	-
		Common	Bridge Approach	94	Fracture	1.00	-
				95	Deterioration of Paint	0.25	-
		Common	Cross beam	96	Disorder of Bearing	0.75	-
				97	Others	0.00	-
		Common	Bridge Approach	98	Water Leakage	0.25	-
				99	Deformation	0.25	-
		Common	Cross beam	100	Others	0.00	-
				101	Debris	0.25	-
		Common	Bridge Approach	102	Settlement	0.50	-
				103	Corrosion	0.25	-
		Common	Cross beam	104	Crack in Steel	1.00	-
				105	Loose Bolts	0.50	-
		Common	Bridge Approach	106	Fracture	1.00	-
				107	Deterioration of Paint	0.25	-
		Common	Cross beam	108	Disorder of Bearing	0.75	-
				109	Others	0.00	-
		Common	Bridge Approach	110	Water Leakage	0.25	-
				111	Deformation	0.25	-
		Common	Cross beam	112	Others	0.00	-
				113	Debris	0.25	-
		Common	Bridge Approach	114	Settlement	0.50	-
				115	Corrosion	0.25	-
		Common	Cross beam	116	Crack in Steel	1.00	-
				117	Loose Bolts	0.50	-
		Common	Bridge Approach	118	Fracture	1.00	-
				119	Deterioration of Paint	0.25	-
		Common	Cross beam	120	Disorder of Bearing	0.75	-
				121	Others	0.00	-
		Common	Bridge Approach	122	Water Leakage	0.25	-
				123	Deformation	0.25	-
		Common	Cross beam	124	Others	0.00	-
				125	Debris	0.25	-
		Common	Bridge Approach	126	Settlement	0.50	-
				127	Corrosion	0.25	-
		Common	Cross beam	128	Crack in Steel	1.00	-
				129	Loose Bolts	0.50	-
		Common	Bridge Approach	130	Fracture	1.00	-
				131	Deterioration of Paint	0.25	-
		Common	Cross beam	132	Disorder of Bearing	0.75	-
				133	Others	0.00	-
		Common	Bridge Approach	134	Water Leakage	0.25	-
				135	Deformation	0.25	-
		Common	Cross beam	136	Others	0.00	-
				137	Debris	0.25	-
		Common	Bridge Approach	138	Settlement	0.50	-</

Common	Deck Slab (steel)	1	Corrosion	0.50	1.50	201	201	1	Corrosion	0.00	3.00	3.00	201	201
		2	Crack in Steel	1.00	1.00	201	201	2	Crack in Steel	0.00	1.00	1.00	101	101
		3	Loose Bolts	0.17	—	—	—	3	Loose Bolts	0.00	—	—	—	101
		4	Fracture	1.00	—	—	—	4	Fracture	0.00	—	—	—	102
		5	Deterioration of Paint	0.17	1.00	—	202	5	Deterioration of Paint	0.00	0.40	—	—	—
		10	Others	0.00	—	—	—	10	Others	0.00	—	—	—	—
		21	Noise / Vibration	0.17	—	—	—	21	Noise / Vibration	0.00	—	—	—	—
		23	Deformation	0.17	—	—	—	23	Deformation	0.00	—	—	—	—
		7	Spalling / Exposed	0.10	0.05	—	202	—	7	Spalling / Exposed	0.00	—	—	—
		8	Water Leakage	0.10	—	1.00	201	8	Water Leakage	0.17	—	—	—	—
		9	Fallen out of Deck	1.00	—	—	201	9	Fallen out of Deck	0.00	—	—	—	—
		10	Crack of Deck	0.15	2.00	1.00	202	10	Crack of Deck	0.00	—	—	—	—
		11	Delamination	0.03	—	—	—	11	Delamination	0.17	—	—	—	—
		16	Others	0.00	—	—	—	16	Others	0.00	—	—	—	—
		17	Reinforcing Material	0.25	—	—	—	17	Reinforcing Material	0.00	—	—	—	—
		18	Abnormal Anchorage	0.25	—	—	—	18	Abnormal Anchorage	0.03	—	—	—	—
		19	Discoloration of Materials	0.03	—	—	—	19	Discoloration of Materials	0.00	—	—	—	—
		1	Corrosion	0.00	—	—	—	1	Corrosion	0.00	—	—	—	—
		4	Fracture	0.00	—	—	—	4	Fracture	0.00	—	—	—	—
		5	Deterioration of Paint	0.00	—	—	—	5	Deterioration of Paint	0.00	—	—	—	—
		16	Others	0.00	—	—	—	16	Others	0.00	—	—	—	—
		19	Discoloration of Materials	0.00	—	—	—	19	Discoloration of Materials	0.00	—	—	—	—
		20	Water Leakage	0.00	—	—	—	20	Water Leakage	0.00	—	—	—	—
		23	Deformation	0.00	—	—	—	23	Deformation	0.00	—	—	—	—
		24	Debris	0.00	—	—	—	24	Debris	0.00	—	—	—	—
		12	Abnormal Spacing	0.00	1.00	1.00	103	12	Abnormal Spacing	0.20	—	—	203	—
		13	Difference in Level	0.00	1.00	1.00	103	13	Difference in Level	0.20	—	—	203	—
		16	Others	0.00	—	—	—	16	Others	0.00	—	—	—	—
		20	Water Leakage	0.00	1.00	1.00	103	20	Water Leakage	0.20	—	—	203	—
		21	Noise / Vibration	0.00	—	—	—	21	Noise / Vibration	0.20	—	—	—	—
		23	Deformation	0.00	1.00	1.00	103	23	Deformation	0.20	—	—	203	—
		24	Debris	0.00	—	—	—	24	Debris	0.00	—	—	—	—
		1	Corrosion	0.00	1.00	1.00	103	1	Corrosion	0.00	3.00	3.00	201	201
		2	Crack in Steel	0.00	—	—	—	2	Crack in Steel	0.00	—	—	—	—
		3	Loose Bolts	0.00	—	—	—	3	Loose Bolts	0.00	—	—	—	—
		4	Fracture	0.00	—	—	—	4	Fracture	0.00	—	—	—	—
		5	Deterioration of Paint	0.00	—	—	—	5	Deterioration of Paint	0.00	—	—	—	—
		12	Abnormal Spacing	0.00	—	—	—	12	Abnormal Spacing	0.00	—	—	—	—
		13	Difference in Level	0.00	—	—	—	13	Difference in Level	0.00	—	—	—	—
		16	Others	0.00	—	—	—	16	Others	0.00	—	—	—	—
		20	Water Leakage	0.00	—	—	—	20	Water Leakage	0.00	—	—	—	—
		21	Noise / Vibration	0.00	—	—	—	21	Noise / Vibration	0.00	—	—	—	—
		23	Deformation	0.00	1.00	1.00	103	23	Deformation	0.00	—	—	—	—
		24	Debris	0.00	—	—	—	24	Debris	0.00	—	—	—	—
		16	Others	0.00	—	—	—	16	Others	0.00	—	—	—	—
		25	Settlement	0.25	150	150	101	25	Settlement	0.25	150	150	101	101
		26	Scouring	1.00	—	—	—	26	Scouring	1.00	—	—	—	—
		28	Deformation	0.00	—	—	—	28	Deformation	0.00	—	—	—	—
		29	Others	0.00	—	—	—	29	Others	0.00	—	—	—	—
		30	Deformation	0.00	—	—	—	30	Deformation	0.00	—	—	—	—
		31	Others	0.00	—	—	—	31	Others	0.00	—	—	—	—
		32	Deformation	0.00	—	—	—	32	Deformation	0.00	—	—	—	—
		33	Others	0.00	—	—	—	33	Others	0.00	—	—	—	—
		34	Deformation	0.00	—	—	—	34	Deformation	0.00	—	—	—	—
		35	Others	0.00	—	—	—	35	Others	0.00	—	—	—	—
		36	Deformation	0.00	—	—	—	36	Deformation	0.00	—	—	—	—
		37	Others	0.00	—	—	—	37	Others	0.00	—	—	—	—
		38	Deformation	0.00	—	—	—	38	Deformation	0.00	—	—	—	—
		39	Others	0.00	—	—	—	39	Others	0.00	—	—	—	—
		40	Deformation	0.00	—	—	—	40	Deformation	0.00	—	—	—	—
		41	Others	0.00	—	—	—	41	Others	0.00	—	—	—	—
		42	Deformation	0.00	—	—	—	42	Deformation	0.00	—	—	—	—
		43	Others	0.00	—	—	—	43	Others	0.00	—	—	—	—
		44	Deformation	0.00	—	—	—	44	Deformation	0.00	—	—	—	—
		45	Others	0.00	—	—	—	45	Others	0.00	—	—	—	—
		46	Deformation	0.00	—	—	—	46	Deformation	0.00	—	—	—	—
		47	Others	0.00	—	—	—	47	Others	0.00	—	—	—	—
		48	Deformation	0.00	—	—	—	48	Deformation	0.00	—	—	—	—
		49	Others	0.00	—	—	—	49	Others	0.00	—	—	—	—
		50	Deformation	0.00	—	—	—	50	Deformation	0.00	—	—	—	—
		51	Others	0.00	—	—	—	51	Others	0.00	—	—	—	—
		52	Deformation	0.00	—	—	—	52	Deformation	0.00	—	—	—	—
		53	Others	0.00	—	—	—	53	Others	0.00	—	—	—	—
		54	Deformation	0.00	—	—	—	54	Deformation	0.00	—	—	—	—
		55	Others	0.00	—	—	—	55	Others	0.00	—	—	—	—
		56	Deformation	0.00	—	—	—	56	Deformation	0.00	—	—	—	—
		57	Others	0.00	—	—	—	57	Others	0.00	—	—	—	—
		58	Deformation	0.00	—	—	—	58	Deformation	0.00	—	—	—	—
		59	Others	0.00	—	—	—	59	Others	0.00	—	—	—	—
		60	Deformation	0.00	—	—	—	60	Deformation	0.00	—	—	—	—
		61	Others	0.00	—	—	—	61	Others	0.00	—	—	—	—
		62	Deformation	0.00	—	—	—	62	Deformation	0.00	—	—	—	—
		63	Others	0.00	—	—	—	63	Others	0.00	—	—	—	—
		64	Deformation	0.00	—	—	—	64	Deformation	0.00	—	—	—	—
		65	Others	0.00	—	—	—	65	Others	0.00	—	—	—	—
		66	Deformation	0.00	—	—	—	66	Deformation	0.00	—	—	—	—
		67	Others	0.00	—	—	—	67	Others	0.00	—	—	—	—
		68	Deformation	0.00	—	—	—	68	Deformation	0.00	—	—	—	—
		69	Others	0.00	—	—	—	69	Others	0.00	—	—	—	—
		70	Deformation	0.00	—	—	—	70	Deformation	0.00	—	—	—	—
		71	Others	0.00	—	—	—	71	Others	0.00	—	—	—	—
		72	Deformation	0.00	—	—	—	72	Deformation	0.00	—	—	—	—
		73	Others	0.00	—	—	—	73	Others	0.00	—	—	—	—
		74	Deformation	0.00	—	—	—	74	Deformation	0.00	—	—	—	—
		75	Others	0.00	—	—	—	75	Others	0.00	—	—	—	—
		76	Deformation	0.00	—	—	—	76	Deformation	0.00	—	—	—	—
		77	Others	0.00	—	—	—	77	Others	0.00	—	—	—	—
		78	Deformation	0.00	—	—	—	78	Deformation	0.00	—	—	—	—
		79	Others	0										

Common	Retaining wall	6	Crack	0.00	5.00	5.00	101	101
		7	Spalling / Exposed	0.00	5.00	-	101	-
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				
		17	Reinforcing Material	0.00				
		19	Discoloration of Materials	0.00				
		23	Deformation	0.00				
		25	Settlement	0.00				
		26	Scouring	0.00				
Common	Road Sign	1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
		19	Discoloration of Materials	0.00				
		23	Deformation	0.00				
		23	Deformation	0.00				
		23	Deformation	0.00				
Portable Steel Truss Steel Arch	Stringer	1	Corrosion	0.00	0.70	0.70	102	102
		2	Crack in Steel	0.00	1.00	1.00	101	101
		3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00	-	1.00	-	101
		16	Others	0.00				
		17	Reinforcing Material	0.00				
		21	Noise / Vibration	0.00				
		22	Abnormal Deflection	0.00				
		23	Deformation	0.00				
Common	Utility Pipe	1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
		19	Discoloration of Materials	0.00				
		23	Deformation	0.00				
		23	Deformation	0.00				
		23	Deformation	0.00				
Common	Wheel Guard	6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				
		18	Abnormal Anchorage	0.00				
		23	Deformation	0.00				
		23	Deformation	0.00				
		23	Deformation	0.00				
		23	Deformation	0.00				

SL	Remedial Measure	Unit	Unit Cost
1	Supplementing Steel Plate	BDT/ m ²	75,045
2	Repainting of Steel Member	BDT/ m ²	2,323
3	Stop hole+Supplementing Steel Plate	BDT/ m ²	75,045
4	Replacement of Steel Member	BDT/ pt	1 (dummy)
5	Crack Injectuon	BDT/ m	5,419
6	Crack Filling	BDT/ m	89
7	Hand Applied Mortar	BDT/ m ³	197,579
8	Fluid Recasting Mortar	BDT/ m ³	95,793
9	Fluid Recasting Concrete	BDT/ m ³	100,036
10	Replacing the Deck Slab	BDT/ m ²	24,958,168
11	Carbon Fiber Sheet Bonding on Concrete	BDT/ m ²	55,422
12	Repairing of Settlement	BDT/ m ³	13,465
13	Reparing of Scouling	BDT/ m ³	13,461
14	Reparing of Foundation Consolodation	BDT/ m ³	13,461
15	Repainting of Bearing	BDT/ pt	1,578
16	Replacement of Bearing	BDT/ pt	96,979
17	Repairing of Expansion Joint	BDT/ m	10,397
18	Replacement of Expansion Joint	BDT/ m	28,922
19	Replacement of Asphalt Pavement (& Waterproofing)	BDT/ m ²	5,880
20	Replacement of Railing	BDT/ m	26,007
21	Replacement of Curb	BDT/ m ³	43,930
22	Replacement of Drainage System	BDT/ pt	5,565
23	Scaffoldings for Bridge Rehabilitation / Strengthening	BDT/ m ²	20,278

Setting of Remedy Measure

Setting of Remedy Measure

Failure < Evaluation Category and Remedy Measure >						
	Component	Element Type	Material	Type of Defects	Cl	Di
Abutment Pier Side Wall	Steel	Corrosion	1. Corrosion	0 : No Remedy	Major Repair	Emergency Steel Plate
		Crack in Steel	2. Crack in Steel	12 : Stop hole / Supplementing Steel	12 : Stop hole / Supplementing Steel	M : PMP Minor Repair Method
	Concrete	Fracture	4. Fracture	X : Impossible to Fix a Method	X : Impossible to Fix a Method	X : Impossible to Fix a Method
		Deterioration of Paint System	5. Deterioration of Paint System	11 : Repainting of Steel Member	- : This category is not exist.	- : This category is not exist.
Substructure	Steel	Crack	6. Crack	21 : Crack Injection	22 : Crack Filling	X : Impossible to Fix a Method
		Spalling / Exposed Rebar	7. Spalling / Exposed Rebar	23 : Hand Applied Mortar	- : This category is not exist.	- : This category is not exist.
	Concrete	Water leakage / Fluorescence	8. Water leakage / Fluorescence	0 : No Remedy	0 : No Remedy	0 : No Remedy
		Delamination	11. Delamination	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.
Foundation Footing	Others	Other Types of Defects	16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method	X : Impossible to Fix a Method
		Defects of Reinforcing material	17. Defects of Reinforcing material	X : Impossible to Fix a Method	- : This category is not exist.	- : This category is not exist.
	Common	Discoloration / Deterioration	19. Discoloration / Deterioration	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.
		Water Leakage / Puddle	20. Water Leakage / Puddle	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Steel	Abnormal Deflection	22. Abnormal Deflection	0 : No Remedy	0 : No Remedy	0 : No Remedy
		Deformation / Break	23. Deformation / Break	0 : No Remedy	0 : No Remedy	0 : No Remedy
	Others	Corrosion	1. Corrosion	0 : No Remedy	0 : No Remedy	0 : No Remedy
		Crack in Steel	2. Crack in Steel	0 : No Remedy	0 : No Remedy	0 : No Remedy
• Primary member	Concrete	Deterioration of Paint System	5. Deterioration of Paint System	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
		Crack	6. Crack	21 : Crack Injection	22 : Crack Filling	X : Impossible to Fix a Method
	Common	Spalling / Exposed Rebar	7. Spalling / Exposed Rebar	23 : Hand Applied Mortar	- : This category is not exist.	- : This category is not exist.
		Delamination	11. Delamination	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.
• Primary member	Others	Other Types of Defects	16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method	X : Impossible to Fix a Method
		Defects of Reinforcing material	17. Defects of Reinforcing material	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
	Common	Deformation / Break	23. Deformation / Break	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
		Settlement / Til / Movement	25. Settlement / Til / Movement	31 : Repainting of Settlement	31 : Repainting of Settlement	X : Impossible to Fix a Method
• Primary member	Scouring	Scouring	26. Scouring	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil	Soil	27. Soil	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Groundwater	Groundwater	28. Groundwater	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Contamination	Soil Contamination	29. Soil Contamination	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Compaction	Soil Compaction	30. Soil Compaction	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Erosion	Soil Erosion	31. Soil Erosion	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Salinity	Soil Salinity	32. Soil Salinity	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Acidification	Soil Acidification	33. Soil Acidification	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Contamination	Soil Contamination	34. Soil Contamination	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Compaction	Soil Compaction	35. Soil Compaction	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Erosion	Soil Erosion	36. Soil Erosion	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Salinity	Soil Salinity	37. Soil Salinity	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Acidification	Soil Acidification	38. Soil Acidification	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Contamination	Soil Contamination	39. Soil Contamination	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Compaction	Soil Compaction	40. Soil Compaction	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Erosion	Soil Erosion	41. Soil Erosion	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Salinity	Soil Salinity	42. Soil Salinity	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Acidification	Soil Acidification	43. Soil Acidification	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Contamination	Soil Contamination	44. Soil Contamination	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Compaction	Soil Compaction	45. Soil Compaction	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Erosion	Soil Erosion	46. Soil Erosion	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Salinity	Soil Salinity	47. Soil Salinity	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Acidification	Soil Acidification	48. Soil Acidification	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Contamination	Soil Contamination	49. Soil Contamination	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Compaction	Soil Compaction	50. Soil Compaction	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Erosion	Soil Erosion	51. Soil Erosion	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Salinity	Soil Salinity	52. Soil Salinity	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Acidification	Soil Acidification	53. Soil Acidification	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Contamination	Soil Contamination	54. Soil Contamination	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Compaction	Soil Compaction	55. Soil Compaction	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Erosion	Soil Erosion	56. Soil Erosion	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Salinity	Soil Salinity	57. Soil Salinity	0 : No Remedy	- : This category is not exist.	- : This category is not exist.
• Primary member	Soil Acidification					

Table < Evaluation Category and Remedy Measure >		C1		Major Repair		M : PMP Minor Repair		M : PMP Minor Repair	
Element Type	Material	Type of Defects	Di	Emergency	M : PMP Minor Repair Method				
Pavement > Including Backside Approach	Others	13. Difference in Level	M : PMP Minor Repair Method	- This category is not exist.					
- Secondary member		14. Abnormal Brilliance Pavement Pavement / Waterpooling	M : PMP Minor Repair Method	- This category is not exist.					
- Secondary member		16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method					
Common	24. Accumulation of Debris		- This category is not exist.	- This category is not exist.					
	1. Corrosion								
	2. Crack in Steel								
	3. Loose or Missing Bolts								
	4. Fracture								
Lighting Facility	Road San Facility								
	5. Deterioration of Paint System								
	Others	16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method					
	19. Discoloration / Detioration			- This category is not exist.					
	23. Deformation / Break			- This category is not exist.					
	1. Corrosion								
	2. Crack in Steel								
	3. Loose or Missing Bolts								
Steel									
	4. Fracture								
	5. Deterioration of Paint System								
	Others	16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method					
	19. Discoloration / Detioration			- This category is not exist.					
	23. Deformation / Break			- This category is not exist.					
Inspection Facility	Utility Pipe								
	1. Corrosion								
	2. Crack in Steel								
	3. Loose or Missing Bolts								
Steel									
	4. Fracture								
	5. Deterioration of Paint System								
	Others	16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method					
	21. Abnormal Noise / Vibration			- This category is not exist.					
	22. Abnormal Deflection			- This category is not exist.					
Common	23. Deformation / Break			- This category is not exist.					
	6. Crack								
	21 : Crack Injection								
	22 : Crack Filling								
	23 : Hand Applied Mortar								
	24 : Water leakage / Efforescence								
	25 : Delamination								
	26 : Other Types of Defects								
Concrete									
	7. Spalling / Exposed Rebar								
	8. Water leakage / Efforescence								
	9. Delamination								
	10. Other Types of Defects								
Others									
	11. Delamination								
	12. Abnormal Spacing								
Common	13. Difference in Level								
	14. Abnormal Spacing								
	15. Other Types of Defects								
	16. Other Types of Defects								
	17. Defects of Reinforcing material								
	18. Water Leakage / Efforescence								
	19. Discoloration / Detioration								
Retaining Wall									
	20. Water Leakage / Efforescence								
	21. Abnormal Deflection								
	22. Abnormal Deflection								
Common	23. Deformation / Break								
	24. Settlement / Tilt / Movement								
	25. Settlement / Tilt / Movement								
	26. Scour								
	27 : Reparing of Scouling								
	28 : Reparing of Settlement								
	29 : Reparing of Tilt								
	30 : Reparing of Tilt								
	31 : Reparing of Settlement								
	32 : Reparing of Scouling								
	33 : Reparing of Settlement								
	34 : Reparing of Tilt								
	35 : Reparing of Tilt								
	36 : Reparing of Settlement								
	37 : Reparing of Scouling								
	38 : Reparing of Settlement								
	39 : Reparing of Tilt								
	40 : Reparing of Tilt								
	41 : Reparing of Settlement								
	42 : Reparing of Scouling								
	43 : Reparing of Settlement								
	44 : Reparing of Tilt								
	45 : Reparing of Tilt								
	46 : Reparing of Settlement								
	47 : Reparing of Scouling								
	48 : Reparing of Settlement								
	49 : Reparing of Tilt								
	50 : Reparing of Tilt								
	51 : Reparing of Settlement								
	52 : Replacement of Expansion Joint								
	53 : Replacement of Expansion Joint								
	54 : Replacement of Expansion Joint								
	55 : Replacement of Expansion Joint								
	56 : Replacement of Expansion Joint								
	57 : Replacement of Expansion Joint								
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	161 : Replacement of Expansion Joint					</td			

A P P E N D I X

ONLY FOR 1st PERIODIC INSPECTION

BMS BASIC DATA TEMPORARY INPUT

MANUAL

1st Periodic Inspection in Bangladesh- BMS Basic Data Temporary Input Manual**Chapter 1. Guideline**

This manual is prepared for 1st periodic inspection in Bangladesh.

Because this periodic inspection is first time in Bangladesh and BMMS (old system) doesn't have enough information to prepare inspection^{*1}, we have to input some of information as temporary to start the inspection.

*¹ In order to carry out inspection, inspector has to bring Bridge Inventory, Blank inspection sheet^{*2} and CHECK LIST of INSPECTION. However, "Basic Data" is necessary to create Inventory and Blank inspection sheet.

After each inspection in 1st periodic inspection, all temporary and missing data have to be modified and filled with result of the inspection.

File Number	R504-009a-20171129				Date	Nov 29, 2017				
Zone	Dhaka	Circle	Dhaka	Division	Manikganj	Sub-Division	Manikganj			
District	Manikganj	Upazila	-	Union	-	Village	-			
Road No.	R504	Road Name	Hemayetpur-Singair-Manikganj	LRP Name	009a	GPS	Lat 23° 48' 20" Long 90° 11' 22"			
Bridge Name	Aynal bridge	LRP - Offset	182 (m)		Chainage	9.182 (m)				
Year of Construction	2008	Design Standard	AASHTO	Design Load	20 Ton	Load Restriction +				
Public Utilities Carried	-									
Bridge Length	25.40 (m)	No. of Spans	1	Span Arrangement	25.4	Skew Angle	-			
Superstructure	Type	Material		Type	Material					
Bridge Type	RC Girder Bridge	Concrete	Deck Slab	-	-					
Abutment	RC	-	Foundation (Abutment)	Piled foundations	-					
Pier	-	-	Foundation (Pier)	Piled foundations	-					
Pavement	Asphalt	-	Bearings	-	-					
Expansion Joint	-	-	Railing	-	-					
Total Width	9.52 (m)	Curb-L	Sidewalk-L	Carriage way-L	Median	Carriage way-R	Sidewalk-R			
Effective Width	7.30 (m)	-	1.11 (m)	-	-	1.11 (m)	-			
Traffic Conditions	Census (Year)	-			Condition Category for Entire Bridge	-	A			
General View										
Aynal Bridge										
										
Aynal Bridge										
										
Aynal Bridge										

fig. Bridge Inventory

Periodic Inspection Edit Sheet																											
File Number	INS-NH1--20171210				Bridge Name	testtestest		Superstructure	Steel Girder Bridge with Concrete Deck		Year	2020															
Zone	Dhaka		Circle	Dhaka	Division	Dhaka		Sub-division	Dhaka		SO																
Inspection Date	2017-12-10												Inspector	Admin													
Survey Result	No. of Cross Beam Line	1				Span Length				12		No. of Spans		1 / 1													
Elements	Defects	Steel				Concrete				Others				Common													
		Corrosion	Crack in Steel	Loose or Missing Bolts	Fracture	Deterioration of Paint System	Crack	Spalling/Exposed Rebar	Water leakage/Efflorescence	Fallen out of Deck Slab	Cracking of Deck Slab	Deamination	Abnormal Spacing	Difference in Level	Abnormal Bituminous Pavement	Functional disorder of Bearings	Other Types of Defects	Defects of Reinforced Materials	Abnormal Anchorage	Discoloration/Deterioration	Water Leakage/Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Deformation/Break	Accumulation of Debris	Settlement/Tilt/Movement	Scouring
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
Main Girder	01																										
	02																										
Cross Beam	03																										
	04																										
Deck Slab (Concrete)	01																										
	02																										
Abutment (Others)	01																										
	02																										
Foundation (RC)	01																										
	02																										
Wing Wall (Sted)	01																										
	02																										
Bearing (Steel) (Steel)	01																										
	02																										
Anchor Bolts	01																										
	02																										
Bearing Seat/Bed	01																										
	02																										
Railing (Steel) (Steel)	01																										
	02																										
Pavement (Asphalt)	01																										
	02																										
Curb	01																										

fig. Blank Inspection Sheet

CHECK LIST of INSPECTION (for First Periodic Inspection)													
> Print out and bring this sheet in First periodic inspection.													
> Note following items meeting bridge type.													
> If you choose "Impossible", note the reason why.													
> After inspection, take scan data (JPG) of this sheet and upload at Bridge Inspection in BMS.													
Bridge Name				Inspection Date									
Road No.				Chainage									
Bridge Type				Inspector									
1. On the bridge													
1	GPS information	All bridge			BMMS			Measured			Impossible to measure		
2	Photos of bridge (Front, Side, Under)	All bridge			BMMS			Measured			Impossible to measure		
3	Bridge Length	All bridge			BMMS			Measured			Impossible to measure		
4	Number of Spans	All bridge			BMMS			Measured			Impossible to measure		
5	Span length (each span)	All bridge			BMMS			Yes			Yes		
6	Widths of Bridge surface	All bridge			BMMS			Yes			Yes		
7	Number of Hinge (each span)	Girder Bridge											
2. Under the bridge													
1	Can you enter under the bridge?	All bridge			BMMS			Measured			Impossible to measure		
2	Number of Main girder	Girder Bridge			BMMS			Measured			Impossible to measure		
3	Number of Cross beam (each span)	Girder Bridge			BMMS			Measured			Impossible to measure		
4	Number of Bearing	Girder Bridge			BMMS			Measured			Impossible to measure		
5	Number of Lateral Bracing	Steel Bridge			BMMS			Measured			Impossible to measure		
6	Number of Stringer	Steel Bridge			BMMS			Measured			Impossible to measure		
7	Height of Main girder	Girder Bridge			BMMS			Measured			Impossible to measure		
8	Width of Main girder	Girder Bridge			BMMS			Measured			Impossible to measure		
9	Interval of Main girders	Girder Bridge			BMMS			Measured			Impossible to measure		
10	Height of Side wall	Culvert			BMMS			Measured			Impossible to measure		

fig. CHECK LIST of INSPECTION

table. Documents to carry out Bridge site inspection

Item	description										
Bridge Inventory	Basic data like as bridge name, location, shape, general photos and so on are shown in this document.										
Blank Inspection Sheet	Blank Inspection sheet is created based on inputted Basic Data automatically. White cells mean necessary to inspect.										
CHECK LIST of INSPECTION	This list is record of inspecting condition of each bridge. This list shows reason why impossible to inspect or get information.										

You can download those documents from BMS.

Chapter 2. Flowchart of 1st Periodic Inspection

Following flowchart shows steps of bridge site inspection.

Bridge inspection always requires adequate preparation and planning.

1. Information Gathering (in your office)

- > You can refer BMMS (and drawings and documents).
- > It is difficult to get length information with BMMS.
- > It's better to carry out *Pre-survey* to get information and general photos.



2. Inputting Basic Data (before Bridge Site Inspection, in your office)

- > Creating new bridge data in BMS and inputting Bridge basic data.
- > If you don't have some information to input basic data, you can refer this manual.
You can input them as temporary data or ignore to input into BMS.



3. Preparation Documents for Bridge Site Inspection (in your office)

- > Print out Bridge Inventory, Blank Inspection Sheet and CHECK LIST of INSPECTION..



4. Bridge Site Inspection

- > Take general photos.
- > Get information of bridge shape and number of each element.
- > Measure bridge length and width.
- > Carry out bridge inspection and note field sketch and rating of defects.



5. After Bridge Site Inspection (in your office)

- > Modify or fill basic data inputted as temporary in BMS.
- > Input the length information into BMS, if you can measure or estimate them.
→ If you can't get length information, input "Temporary length" referring this manual.
- > Upload general photos to BMS.
- > Take scan data of field sketch and CHECK LIST and upload them to BMS.
- > Edit photo book excel sheet and upload it to BMS as PDF.

fig. Flowchart of Bridge Site Inspection

Chapter 3. Two types of Temporary input

In this manual, two types of temporary input method exist like as following.

It is necessary to pay attention to judge which type of temporary input you use.

➤ Temporary input to create Blank inspection sheet (rifer Chapter 4)

Because before 1st Periodic Inspection, it is necessary to create blank inspection sheet, you may input temporary data to fill Basic Data form.

This type of temporary input allows to set only before bridge site inspection.

After bridge inspection, “all” temporary inputted data should be modified or filled with true data based on result of the bridge inspection.

e.g. Basic Name / Shape / Road / Location / Element except “length of main girder / culvert”

➤ Temporary input because of impossibility to get the information (rifer Chapter 5)

BMS requires some length information like as “height of main girder, width of main girder, interval of main girders” to calculate rough cost estimate.

Because of difficulty to approach to the main girder, it may be impossible to get the length information. However without the length data, BMS can't calculate it.

If you judge impossible to get the length information, you can use temporary data base on formula shown in this manual.

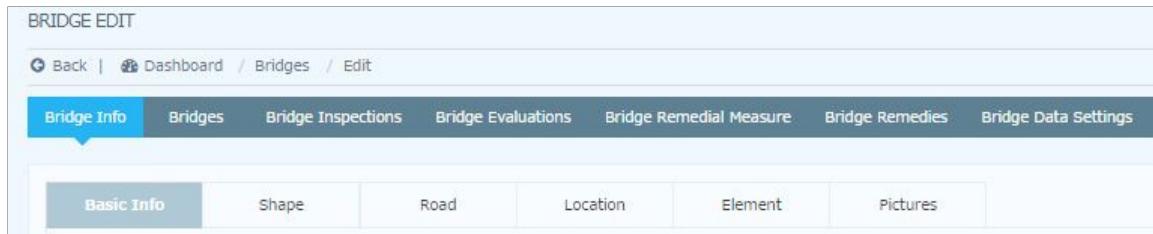
e.g. Height of Main Girder / Width of Main Girder / Interval of Main Girders

Width of Culvert / Height of Side Wall

Chapter 4. Temporary input to create Blank inspection sheet

In order to make blank inspection sheet for 1st inspection of each bridge, if you don't have required information, input Basic Data as following rule.

You should try to get actual value for all Basic Data inputted as temporary in site inspection.



< **Basic Info** : for Bridge / Box Culvert>

1. Bridge NO.*

Bridge NO. is made with GPS(Coordinate) based on following basically.

- GPS Latitude : 12 degree 34 minute 56 second
- GPS Longitude : 98 degree 76 minute 54 second
- Bridge NO. : **123456987654** (12 letters)
- If the bridge is “parallel bridge (two bridges are built side by side)”, because GPS of the bridges are same, 13th letter is required in order to distinguish the bridges. Most popular case of parallel bridge is “upper scream side” and “down scream side”. If the bridge locates upper scream side, add “1” as 13th letter. If down scream side, “2”.

[Temporary Input]

If the bridge doesn't have GPS information yet, you input temporary figure like as following,

- YYYYMMDDhhmm
: Y is year, M is month, D is date, h is hour and m is minute when you input the cell like as “201707220958”. (2017/22/July AM 9:58)
- You have to get GPS of the bridge at the site. After getting it, temporary number should be modified.

2. Bridge Name*

Bridge Name should be inputted following rule.

- First letter of each word is *Capital letter*. You can't use Capital letter except them.
- If it's necessary to input number after bridge name, you can't insert space between bridge name and “-“. Ex. Test River Bridge-1

[Temporary Input]

If you don't know the Name, input temporary name as “Bridge No.”.

3. Bridge Type*

Choose a type of the bridge.

[Temporary Input]

If you don't have accurate information, choose temporary type from following types.

- If the bridge name includes “bridge” or bridge length is over 10m, then RC Girder Bridge.
- If the bridge name includes “culvert” or bridge length is under 10m, then Box Culvert

Note

If you refer data of BMMS (old system),

- “RCC Girder Bridge” should be inputted as “RC Girder Bridge”.
- “Steel Beam & RCC Slab” should be inputted as “Steel Girder Bridge”.
- “Bailey Bridge” should be inputted as “Portable Steel Bridge”.
- “Slab Culvert” should be inputted as “Box Culvert”.

4. Completion Year

Input year to complete building the bridge.

[Temporary Input]

If you don't know it, input temporary year as “2050”.

5. Reconstruction Year

If the bridge was rebuilt, input year to complete rebuilding the bridge.

If the bridge has not rebuilt, this cell should be blank.

If you don't have the information, this cell should be blank.

6. Design Standard

If you have information of Design Standard to design the bridge, choose it.

7. Design Load

Design Load is maximum load of vehicles in design the bridge.

If you don't have the information, this cell should be blank.

8. Load Restriction (ton)

Load Restriction is set to control heavy vehicles because of damage of the bridge.

If you don't have the information or no restriction, this cell should be blank.

9. Crossing & Public Utility

After choosing crossing condition under the bridge from pull-down menu, new cell to input information of the crossing condition is created automatically. Input the information.

If the bridge has public utility like as gas, water or electricity, input it by same operation. You can input multiple items. If you don't have the information, this cell should be blank.

9. Crossing & Public Utility

Water pipe	<input type="button" value="▼"/>
If you don't know, no need to choose	
Information Of River :	<input type="text"/> Meghna River <input type="button" value="x"/>
Information Of Water pipe :	<input type="text"/> a water pipe (owner is unknown) is attached under girder <input type="button" value="x"/>

10. Crossing under Bridge*

Choose nearest condition of under the bridge from pull-down menu.

[Temporary Input]

If you don't have the information, you can input temporary figure as "Unknown".

11. Bridge Owner

Input owner name like as RHD office name.

If you don't have the information, this cell should be blank.

12. Description

Input explanation of the bridge, if it is necessary.

Public View

Public user can look information in this tab, if you click on this check box.

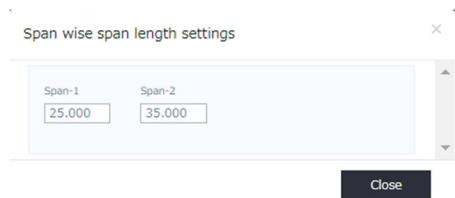
Click on the check box*.

< **Shape**: for Bridge : except Box Culvert and Slab Culvert >

1. Bridge Length*, 4. No. of Span*,

5. Input Span Length and 6. Span Arrangement

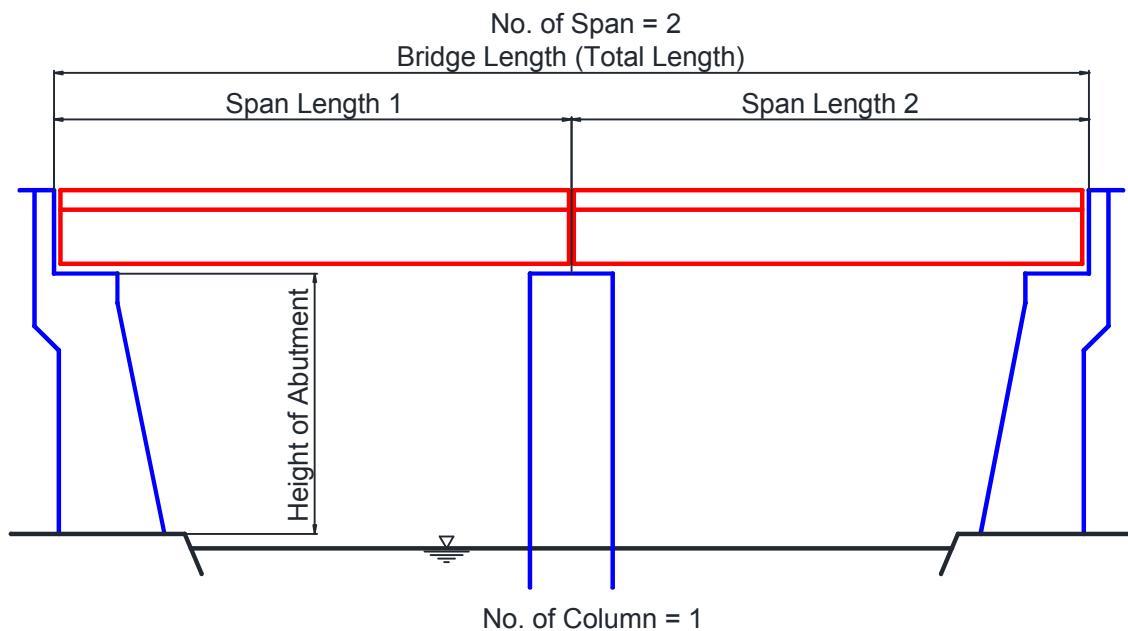
Input length of the bridge. If No. of Span is 1, Span length is same as Bridge Length. After inputting “4. No. of Span”, you can input span lengths in “5. Input Span Length” as same number as No. of Span.



[Temporary Input]

If you don't have the information,

- 1. Bridge Length : Input temporary figure as “999.000”.
- 4. No. of Span : Input temporary figure as “5”.
- 6. Span Arrangement : Input temporary figure as “999.000”.



7. No. of Column, 8. Column Width and 9. Height of Abutment

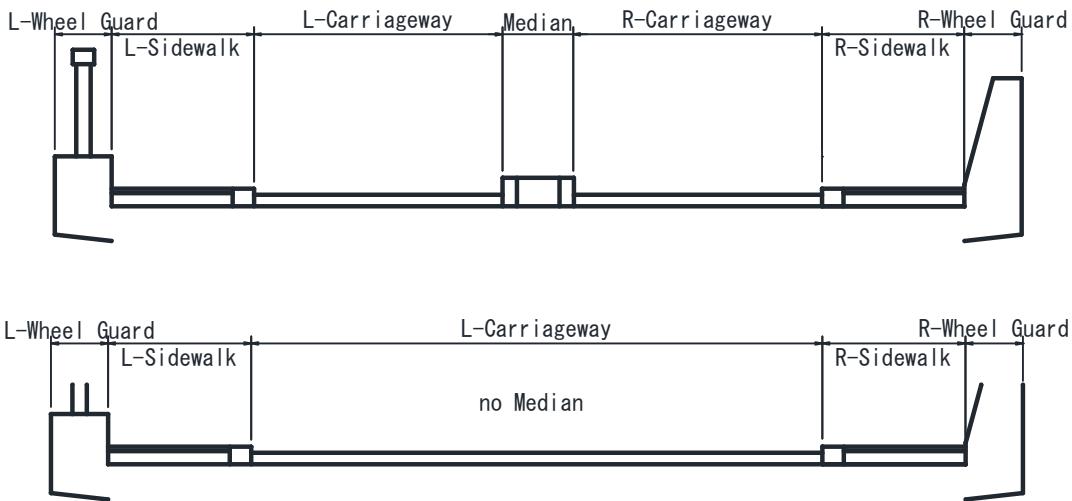
Input shape of substructure.

If you don't have the information, those cells should be blank.

2. Bridge Width*, 3. Bridge Effective Width***11. Median, 12(13). L(R)-Wheel guard, 14(15). L(R)-Carriageway,****16. Lanes On Structure, 17. No. of Sidewalk and 18(19). L(R)-Sidewalk**

Input width of the bridge referring follow a figure.

If the bridge doesn't have Median, it's not necessary to input R-Carriageway.

*[Temporary Input]*

If you don't have the information,

- 2. Bridge Width : Input temporary figure as "999.000".
- 3. Bridge Effective Width : Input temporary figure as "999.000".
- Other items : Keep blank as temporary.

21. Interval of Main Girders (except Culvert Bridge),**22. Height of Main Girder (except Culvert Bridge) and****23. Width of Main Girder (except Culvert Bridge)**

Input shape of Main Girder.

Each item shows different length by bridge type. Refer following figures.

[Temporary Input before 1st Site Inspection]

If you don't have the information, this cell should be blank.

[Temporary Input after 1st Site Inspection]

It may be impossible to measure some length, because of inspector can't approach it.

In that case, the length should be guessed based on photos.

If you can't get the length yet, input temporary figure in Chapter 5.

10. Skew Angle Degree

Input angle of “parapet wall” and “direction of traffic”.

Skew angle of bridges are mainly 90° (straight bridge).

If you don't have the information, this cell should be blank.

24. No. of Lines of Cross Beam (except Box Culvert)

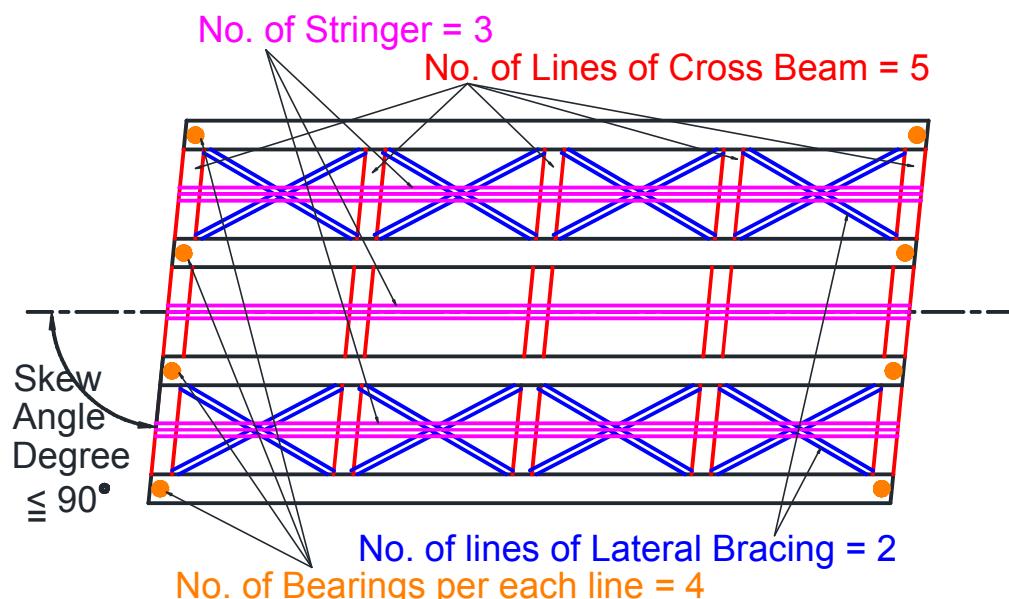
25. No. of Lines of Stringer (Steel Girder Bridge)

27. No. of Bearings per each line (except Box Culvert)

28. No. of Lines of Lateral Bracing (Steel Girder Bridge)

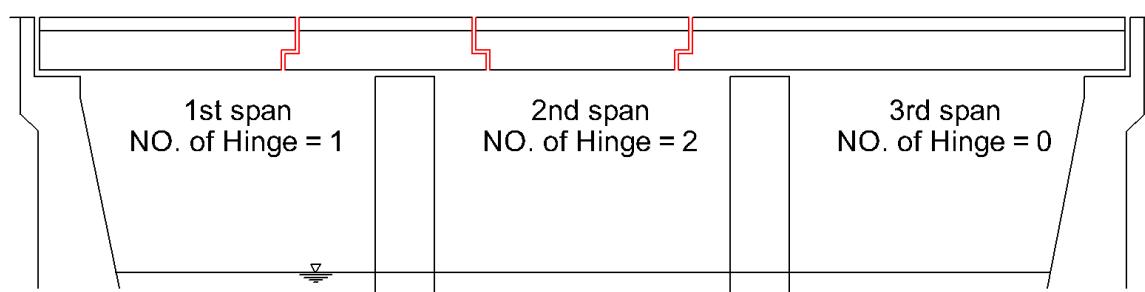
Input number of each lines if the element exists.

If you don't have the information, this cell should be blank.

26. NO. of Hinge

Input number of the Gerber hinge for each span.

If you don't have the information, this cell should be blank.



<Shape: for Box Culvert >

1. Bridge Length*, 5. Input Span Length and 6. Span Arrangement

Refer <Shape: for Bridge >.

4. No. of Span*

[Temporary Input]

If you don't know the info, you can input temporary figure like as

- Bridge Length < 3.5 m : input temporary figure as "1".
- Bridge Length > 3.5 m : input temporary figure as "Round up (Bridge Length / 3.5) +1".
- You don't know the bridge length : input temporary figure as "5".

2. Bridge Width*, 3. Bridge Effective Width*, 11. Median, 12(13). L(R)-Wheel guard,
14(15). L(R)-Carriage way, 16. Lanes On Structure, 17. No. of Sidewalk and 18(19). L(R)-Sidewalk

Refer <Shape: for Bridge >.

21. Width of Culvert (m) and 22. Height of Side Wall (m)

Input shape of Box Culvert.

Each item shows different length by bridge type. Refer Chapter 5.

[Temporary Input **before 1st Site Inspection**]

If you don't have the information, this cell should be blank.

[Temporary Input **after 1st Site Inspection**]

It may be impossible to measure some length, because of inspector can't approach it.

In that case, the length should be guessed based on photos.

If you can't get the length yet, input temporary figure in Chapter 5.

< Road : for Bridge / Box Culvert>

1. Road Class*, 2. Road No.* and 3. Road Name

Input information of the road.

You always have these info.

4. LRP Name

Input LRP Name if you can get it from current BMMS.

If you don't have the information, this cell should be blank.

5. New LRP Name

Input New LRP Name of the bridge after putting a new rule of LRP Name.

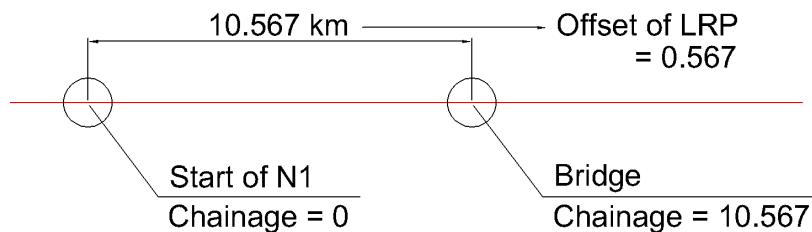
If you don't have the information, this cell should be blank.

6. Offset of LRP and 7. Chainage

Chainage is distance between start of the road and bridge location.

Offset of LRP is figure shown as down to the decimal point of Chainage.

If you don't have the information, this cell should be blank.



8. Number of Lanes

Input number of traffic lanes on the bridge. (same as “16. Lanes On Structure” in Shape)

If you don't have the information, this cell should be blank.

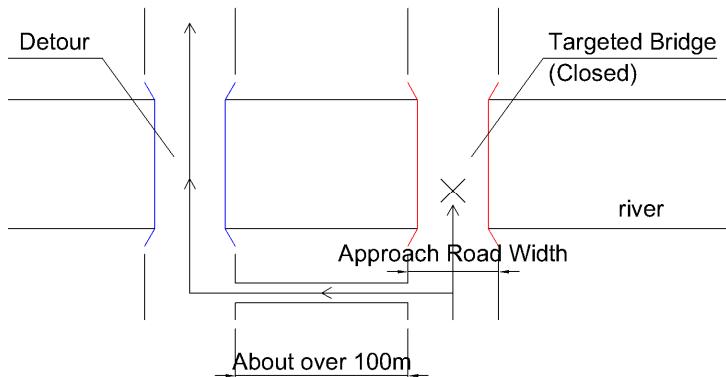
9. Approach Road Width

Input width of approach road of the bridge.

If you don't have the information, this cell should be blank.

10. Detour/Alternate Route*

If there is another road near the bridge to be able to use as substitute the bridge, choose “exist”.



Ex.

When targeted bridge is closed, user can use another bridge as Detour.

In this case, importance degree will be set as lower.

[Temporary Input]

If you don't have this information, choose “none” as temporary.

11. Traffic Volume*, 12. Heavy Vehicle Traffic Rate and 13. Census

Choose range of Traffic Volume of the bridge.

This volume shows AADT (Annual Average Daily Traffic).

Note

You can refer RMMS (Road Maintenance & Management System) of RHD.

1. Access to <http://www.rhd.gov.bd/RoadDatabase/> and search targeted Road No.
2. Click “Show details” at Traffic (AADT).

Basic Info		Traffic & Other Info		Location	
Road No.	N503	Traffic (AADT)	7679 (Motorized: 5785 , Non-Motorized: 1894) Show details		
Road Name	Utholi-Aricha Road	Average width	7.32 (ft) Width Detail		
Class	National Highway	No. of bridges	8		
Length	3.269 Km	No. of ferry ghatas	0		
Location referencing points - LRP's (what is a LRP?)		14 LRP Listing			

4. Choose link No. nearest to targeted bridge and check most right column, “Traffic(AADT)”

- Heavy Vehicle Traffic Rate is calculated as
“ {AADT – (total number of truck and bus)} / AADT ” (Micro bus is not including)
- Census is year of last inspection of traffic volume
Census is survey year of each traffic data. If you don't know, keep blank.

< Location: for Bridge / Box Culvert>

1. Zone*, 2. Circle*, 3. Division* and 4. Sub Division*

Choose division information of the bridge.

You always have these info.

5. SAE*

SAE is Section Officer. Choose one from pull-down menu.

[Temporary Input]

If you don't have this information, you can choose SO-1 temporally

6. District, 7. Upazilla, 8. Union, 9. Village and 10. Country

Input location of the bridge.

First letter of each word is Capital letter. You can't use Capital letter except them.

If you don't have the information, this cell should be blank.

11. GPS Latitude, 12. GPS Longitude

Input GPS information of the bridge.

They should be inputted as "xx Degree xx Minute xx Second".

Note

GPS information is required to display map and make Bridge No.

Input Reference Level of the bridge. If you don't know, keep blank.

< Element >

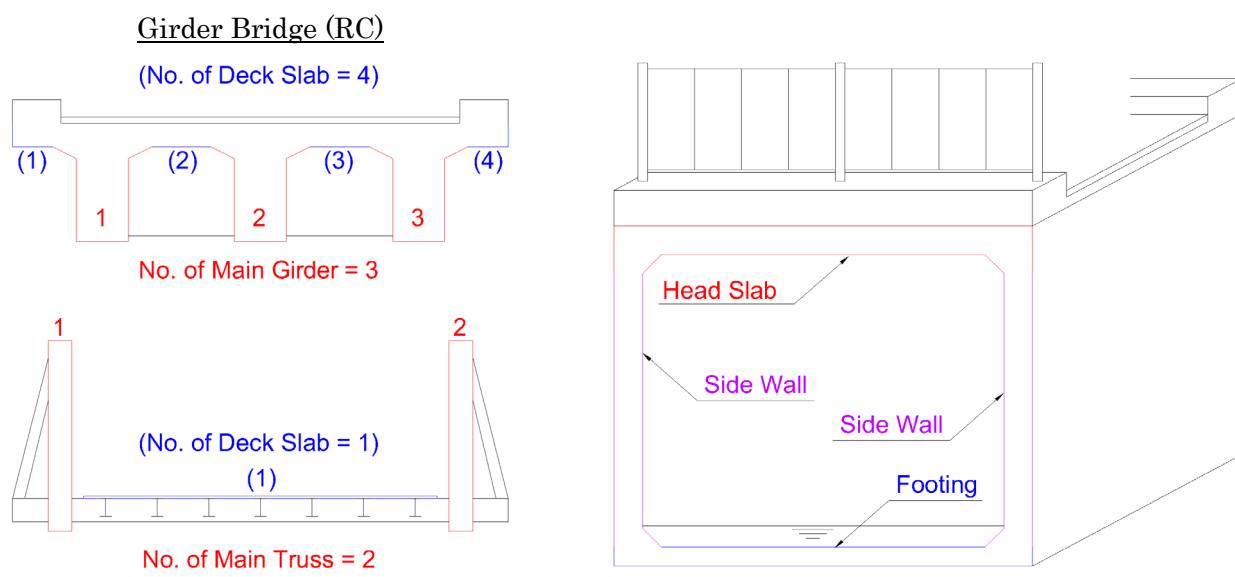
If you don't know the information of each Element, refer following table.

- “Girder Bridge” in following table includes “RC / PC / Steel Girder bridge, Box girder bridge, RC slab bridge, Rigid frame bridge and Small slab bridge”.
- “Truss Bailey” in following table includes “Truss PSB”.
- “Culvert” in following table includes “Box Culvert”.

Super-structure

*PSB means Portable Steel Bridge

Element	Temporary Parameter	Temporary Number of the Element				Remarks
		Girder Bridge	Truss PSB*	Masonry Arch	Culvert	
1	Main Girder	-	6	-	-	
2	Main girder Hinge	-	-	-	-	no need for temporary
3	Cross Beam	-	only click on Checkbox	only click on Checkbox	-	number has set in "Shape" no need to input figure
4	Stringer	-	-	6	-	
5	Deck Slab (Concrete)	Concrete	Remarks	-	-	= No. of Main Girder + 1
6	Main Truss	-	-	2	-	
7	Arch Rib	-	-	-	1	
8	Outer Cable	-	-	-	-	no need for temporary
9	Main Tower	-	-	-	-	no need for temporary
10	Head Slab	-	-	-	-	1
11	Lateral Bracing	-	-	-	-	no need for temporary
12	Deck Slab (PC)	-	don't use	-	-	use "Deck Slab (Concrete)"
13	Deck Slab (Steel)	Steel	Remark	-	-	= No. of Main Girder + 1

Basic Shape of Girder Bridge / Bailey Bridge / Culvert

Sub-structure

Element	Temporary Parameter	Temporary Number of the Element				Remark
		Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
14 Pier	Unknown	-	-	-	-	un-editable
15 Abutment	Unknown	-	-	-	-	un-editable
16 Foundation	Unknown	-	-	-	-	un-editable
17 Wing Wall	-	-	-	-	-	no need to input
18 Footing	-	-	-	-	1	
19 Side wall	-	-	-	-	2	

Bearings

Element	Temporary Parameter	Temporary Number of the Element				Remark
		Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
20 Bearing (Steel)	Steel	only click on Checkbox	only click on Checkbox	-	-	un-editable
21 Bearing Seat/Bed	-	-	-	-	-	un-editable
22 Bearing (Rubber)	Rubber	-	-	-	-	un-editable

Deck Surface

Element	Temporary Parameter	Temporary Number of the Element				Remark
		Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
23 Railing (Steel)	Steel	2	2	2	2	
24 Pavement	Asphalt	-	-	-	-	un-editable
25 Wheel Guard	-	2	2	2	2	
26 Railing (Concrete)	-	-	-	-	-	no need for temporary
27 Curb	-	-	-	-	-	no need for temporary

Other Elements

Element	Temporary Parameter	Temporary Number of the Element				Remark
		Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
28 Drainage System	-	1	1	1	1	
29 Inspection Facilities	-	-	-	-	-	no need for temporary
30 Road sign	-	-	-	-	-	no need for temporary
31 Utility Pipe	-	-	-	-	-	no need for temporary
32 Lighting Facility	-	-	-	-	-	no need for temporary
33 Bridge Approaches	-	-	-	-	-	un-editable
34 Expansion Joint(Rubber)	-	-	-	-	-	
35 Expansion Joint(Steel)	-	only click on Checkbox	only click on Checkbox	-	-	un-editable
36 Retaining Wall	-	only click on Checkbox	only click on Checkbox	only click on Checkbox	only click on Checkbox	un-editable

< Pictures : for Bridge / Box Culvert>

No need to upload pictures before 1st Periodic Inspection.

Chapter 5. Temporary input because of impossibility to get the information

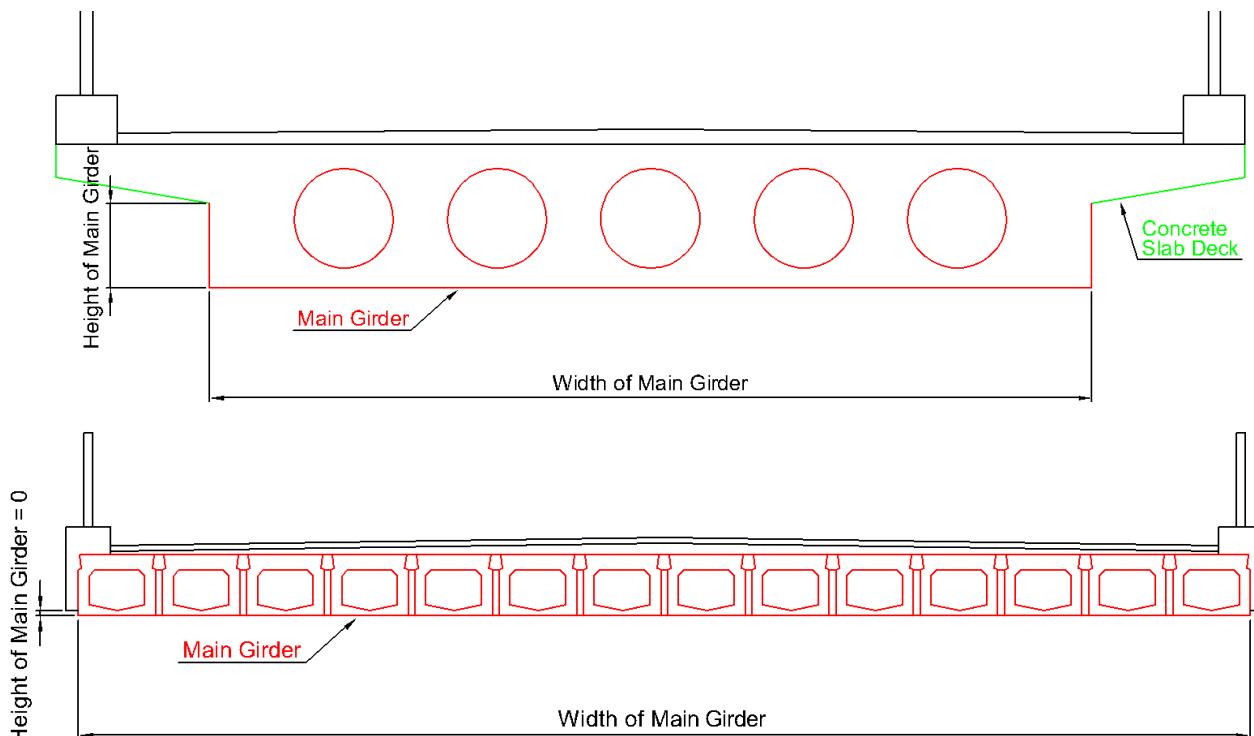
This chapter shows formula to calculate temporary length of main girder or box culvert.

You can refer this chapter **only if you completely unable to get length information in bridge site.**

Only for popular bridge type in Bangladesh, this manual shows formula.

The length calculated with formula should be rounded up by first decimal place. e.g. 3.500 m

[Small Slab Bridge / RC Slab Bridge]



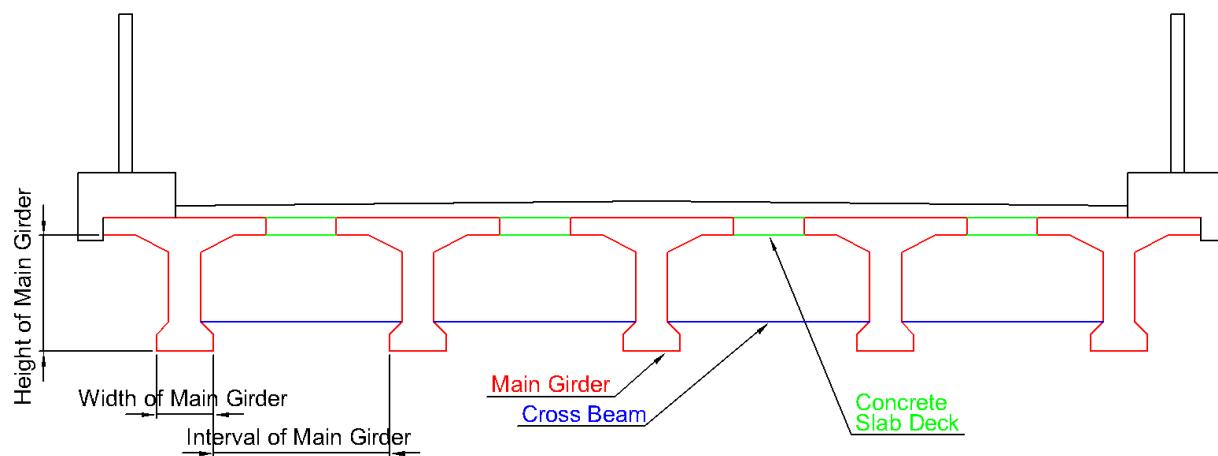
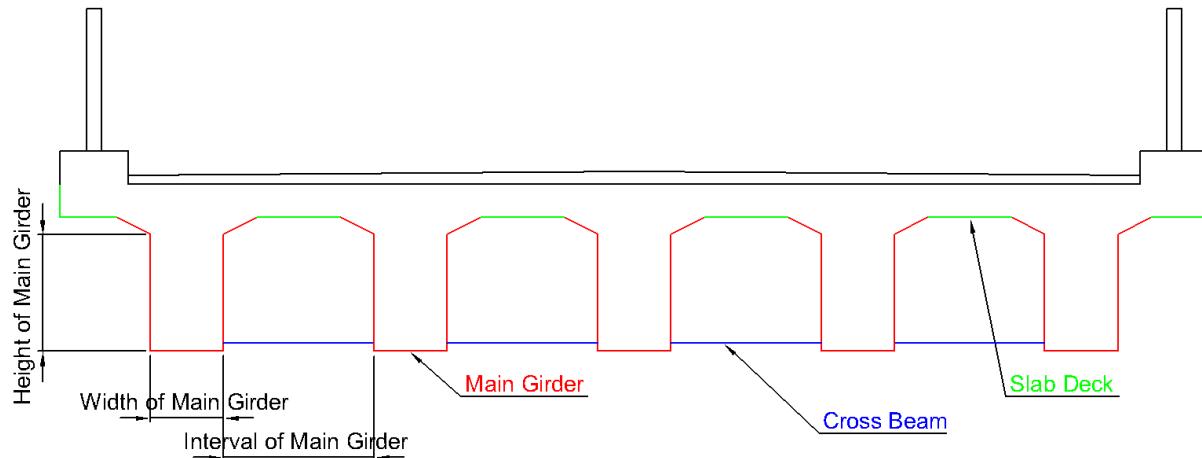
- Interval of Main Girder : input always “0”.
- Height of Main Girder : Temporary = “0”
- Width of Main Girder : Temporary = “Effective Width”

e.g. *Temporary input case*

If Effective width = 7.500m,

- Interval of Main Girder = 0.000m : always
- Height of Main Girder = 0.000m : temporary
- Width of Main Girder = 7.500m : temporary

[RC Girder Bridge / PC Girder Bridge]



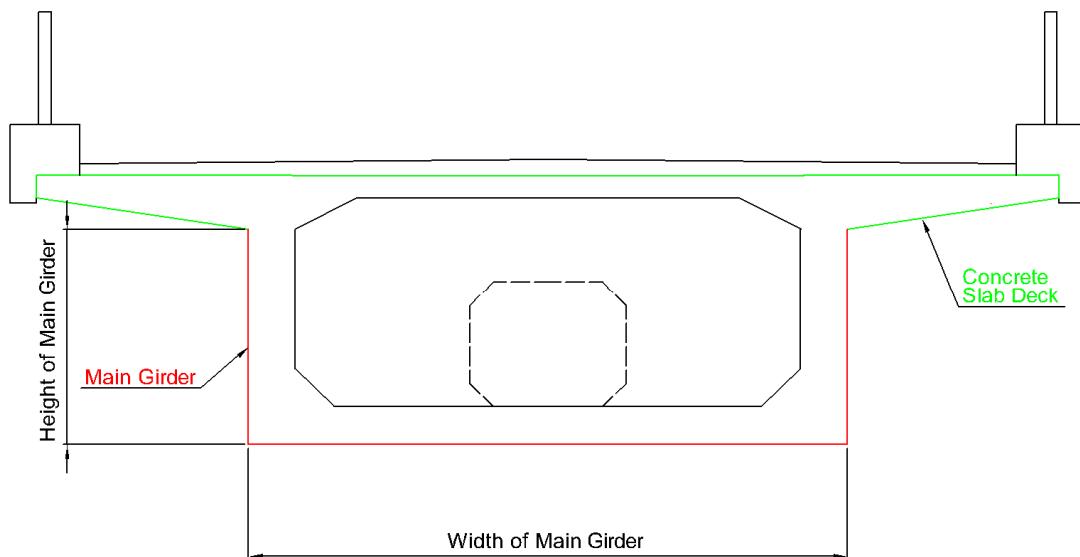
- Interval of Main Girder : Temporary = "Effective Width" / ("NO. of Main Girder" - 1)
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : Temporary = 0.300 m

e.g. *Temporary input case*

If Span length = 30.000m, Effective width = 10.000m and Number of Main Girder = 5,

- Interval of Main Girder = $10.000\text{m} / (5-1) = 2.500\text{m}$: temporary
- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 0.300m : temporary

[RC Box Girder Bridge / PC Box Girder Bridge]



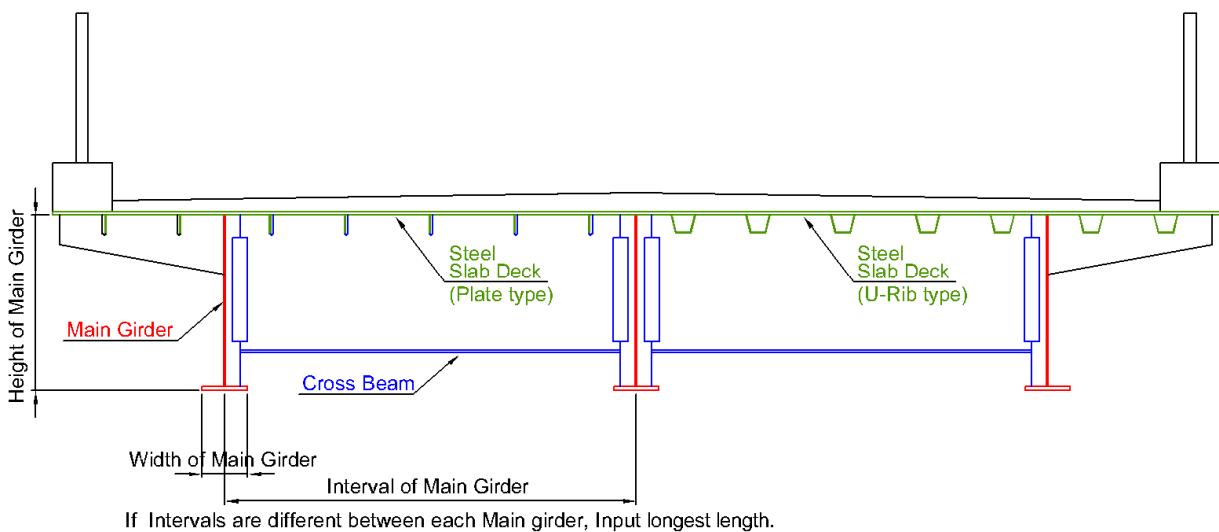
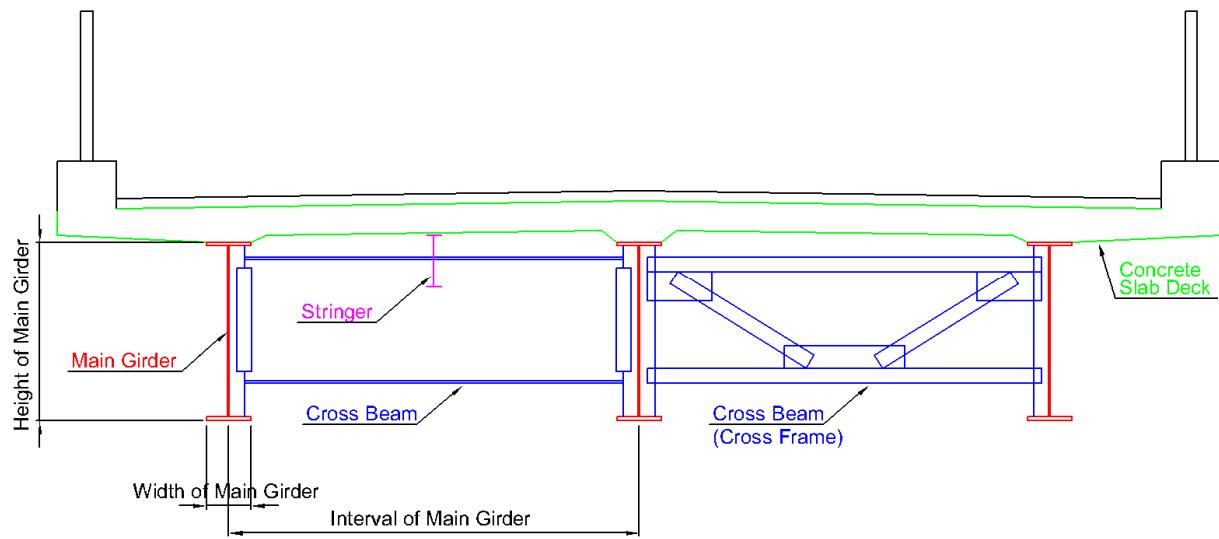
- Interval of Main Girder : input always “0”
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : “Effective Width”

e.g. Temporary input case

If Span length = 30.000m and Effective width = 10.000m,

- Interval of Main Girder = 0.500m : always
- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 10.000m : temporary

[Steel Girder Bridge]



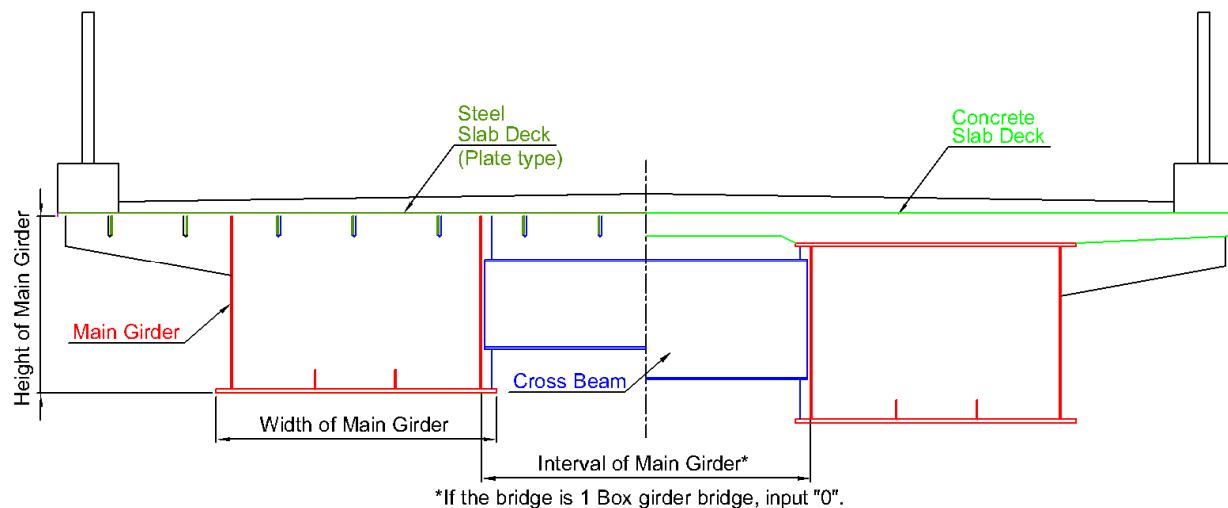
- Interval of Main Girder : Temporary = "Effective Width" / "NO. of Main Girder"
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : Temporary = "Height of Main Girder" / 5

e.g. *Temporary input case*

If Span length = 30.000m, Effective width = 7.500m and Number of Main Girder = 3,

- Interval of Main Girder = $7.500\text{m} / 3 = 2.500\text{m}$: temporary
- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = $2.000\text{m} / 5 = 0.400\text{m}$: temporary

[Steel Box Girder Bridge]



(Multiple box girders bridge)

- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = 2.500m
- Interval of Main Girder : Temporary =

$$\text{“Effective Width”} - \text{“Width of Main Girder”} \times \text{“NO. of Main Girder”}$$

e.g. Temporary input case (Multiple main girder)

If Span length = 30.000m, Effective width = 10.000m and Number of Main Girder = 2,

- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 2.500m : temporary
- Interval of Main Girder = $10.000\text{m} - 2.500\text{m} \times 2 = 5.000\text{m}$: temporary

(Single box girders bridge)

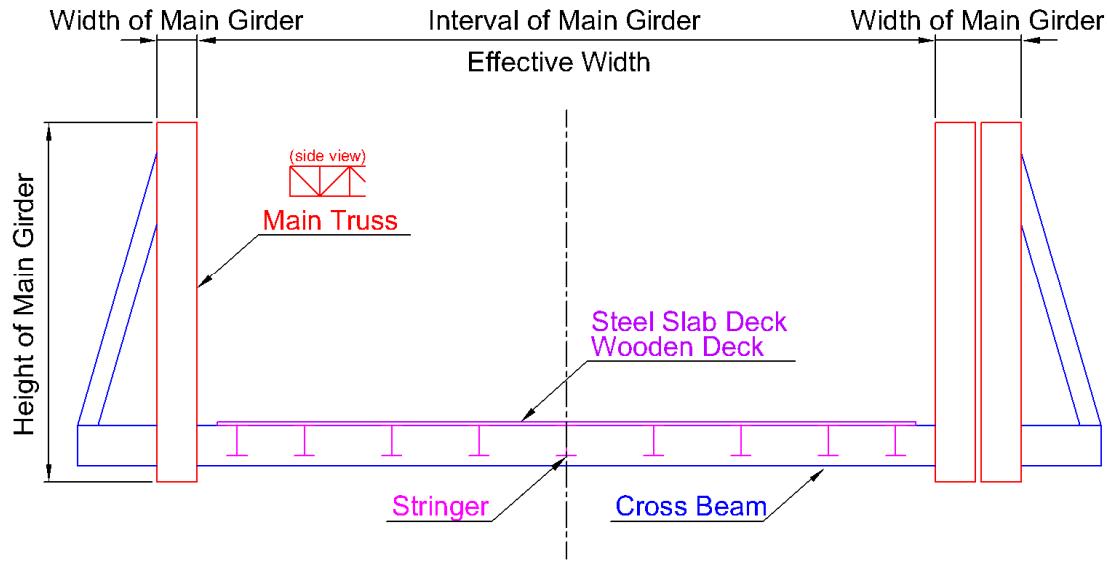
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = “Effective Width”
- Interval of Main Girder : input always “0”

e.g. Temporary input case (Multiple main girder)

If Span length = 30.000m, Effective width = 7.500m and Number of Main Girder = 1,

- Height of Main Girder = $30.000\text{m} / 15 = 2.000\text{m}$: temporary
- Width of Main Girder = 7.500m : temporary
- Interval of Main Girder = 0.000m : temporary

[Truss Bridge / Portable Steel Bridge]

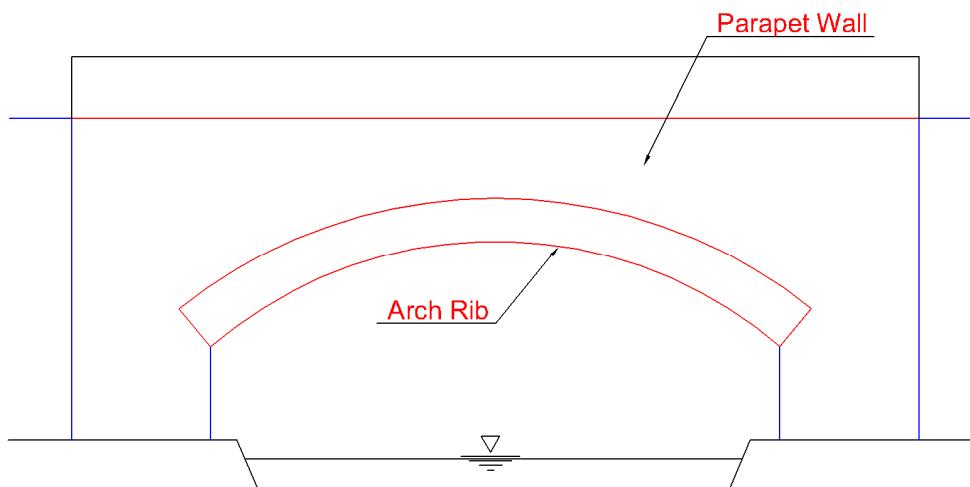


- Interval of Main Girder : always same as "Effective Width".
- Height of Main Girder : Temporary = 2.000 m
- Width of Main Girder : Temporary = 0.200 m

[Masonry Arch Bridge]

It is not necessary to input girder length of Masonry Arch Bridge because of following reason.

- The shape is markedly different from other bridge types. It is impossible to apply above inputting rules.
- Remedial measures in Bridge Rehabilitation/Strengthening Manual is not applied to Masonry Arch Bridge, because only this bridge is made with masonry. Therefore, this bridge type is not targeted to calculate rough cost estimate to remedy. It means length information to calculate is not required from BMS.



[Mixed Types Bridge]

This bridge type is not shown in Inspection & Evaluation Manual. Mixed Types Bridge is always multiple span bridge and defined as following,

- The bridge consists of multiple types of bridge.

e.g.

1st span : **RC Girder Bridge**, 2nd span : **PC Box girder Bridge**, 3rd span : **RC Girder Bridge**

- The bridge consists of multiple materials.

e.g.

1st span : **RC Girder Bridge**, 2nd span : **Steel Girder Bridge**, 3rd span : **RC Girder Bridge**

- The bridge consists of multiple types and materials.

e.g.

1st span : **RC Girder Bridge**, 2nd span : **Steel Box Girder Bridge**, 3rd span : **RC Slab Bridge**



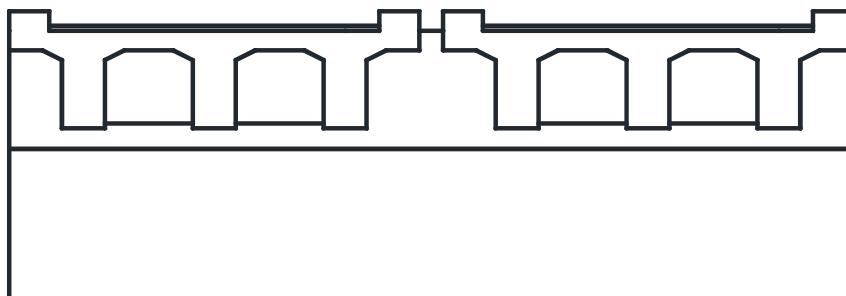
Because only a type of bridge is enabled into BMS, this type is required to manage BMS.

Note

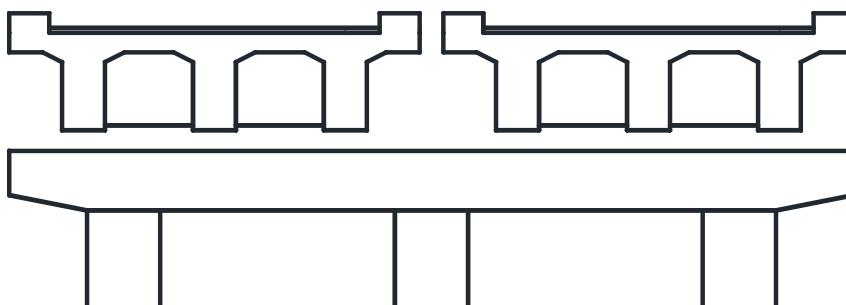
- Number of Main Girder, cross beam and so on of Basic Data should be inputted as maximum number of main girder in all spans.
- Inspection sheet and Evaluation sheet of Mixed Types Bridge consist of “All types of defects” (both of types of defects of “Concrete” or “Steel (rubber)”). Cells of inspection sheet not required (e.g. concrete defect of steel element) should be inputted as “-“.
- Cells of evaluation sheet not required (e.g. concrete defect of steel element) should be inputted as “N“.

[How to input Parallel bridge sharing one substructure]

In the case of “Parallel bridge (two bridges being built side by side.)”, one substructure supports both of two superstructures like as following drawings.



e.g. One Abutment with parallel bridges

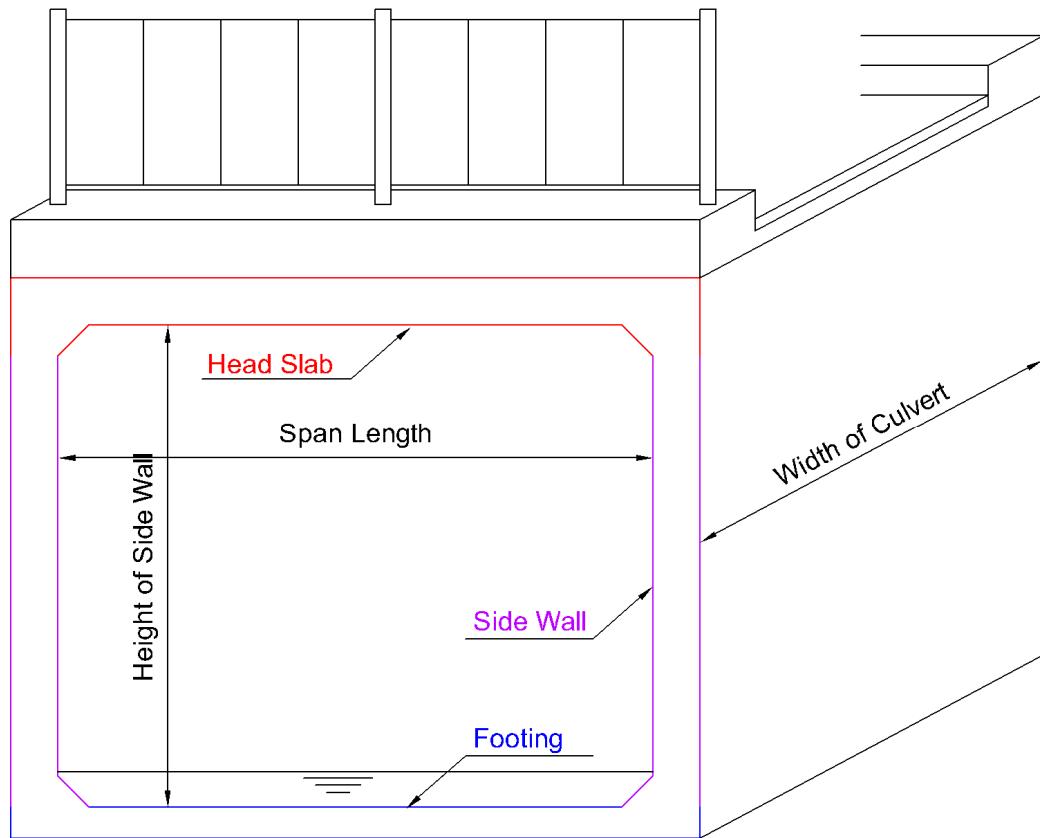


e.g. One Pier with parallel bridges

How to input the parallel bridges is shown as following.

- Parallel bridges should be registered as **TWO bridges**. (separated bridges)
 - Bridge No. is inputted as following,
 - Bridge locating upstream side : 12 letters (by GPS) + 1 (**13th letter**)
 - Bridge locating downstream side : 12 letters (by GPS) + 2 (**13th letter**)
 - Each substructure should be inspected as **ONE component**. However, BMS requires result of superstructure and substructure. Therefore, inputting result should be carried out as following,
 - Bridge locating upstream side
 - : Result of the superstructure of upstream side + **Result of the substructure***
 - Bridge locating downstream side
 - : Result of the superstructure of downstream side + **Result of the substructure***
- * Result of the substructure is **same result**.

[Box Culvert]



- Width of Culver : Same as "Bridge Width".
- Height of Side Wall : Temporary = 2.000 m

e.g. Temporary input case

If Bridge width = 7.500m,

- Width of Culver = 7.500m : temporary
- Height of Side Wall = 2.000m : temporary



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