

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



Bridge Management System (BMS) Manual for System Administrators

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: NS | All | National | Regional | Zilla Road

Overall Condition: A | B | C | D | Any

No. of spans (between): [] and []

Overall Span Length (between): [] and []

Age (between): [] and []

Load restriction: Yes | No

Search

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

Output : 4 separate lists

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 | N6 | All | National | Regional | Zilla Road

Overall Condition: A | B | C | D | Any

No. of spans (between): [] and []

Overall Span Length (between): [] and []

Age (between): [] and []

Load restriction: Yes | No

Search

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.

Output : 1 list

Search Result Search by structure name

Records Per page : 20

Search Status BCS1 Condition : C

Record(s) found : 3916

Criteria

Photo function is almost dead.

Road No.	Chaitage	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	1.044			
N1	17.134	RCC Girder Bridge	LRP017b	Langabandh Bridge.	159.52	C	1.497			
N1	18.742	PC Girder Bridge	LRP018a	MOLLIK PARA BRIDGE (R)	40.5	C	1.4			
N1	24.393	PC Box	LRP024a	MEGHNA BRIDGE	900	C	1.9			
N1	34.111	Box Culvert	LRP034c	BOCTAR KANDI BOX CULVERT	5.1	C	1			
N1	37.01	PC Box	LRP037a	Daud Kandi Bridge	1408.8	C	0.5			
N1	39.304	RCC Girder Bridge	LRP040b	Baldhakhal Bridge	23.1	C	0.19			
N1	39.304	RCC Girder Bridge	LRP040b	BALDHA KHAL RCC GIRDER BRIDGE	21.8	C	2.7			
N1	42.936	RCC Girder Bridge	LRP043a	Shahid Nagor Bridge	16.5	C	0.645			
N1	42.936	RCC Girder Bridge	LRP043a	SHAHID NAGIR	16.5	C	20.96			
N1	45.164	Box Culvert	LRP046a	SARKAR BARI CULVERT	3.9	C	4.95			
N1	46.871	Slab Culvert	LRP047a	AMIRABATH SLAB CULVERT	6.5	C	2.77			
N1	48.384	RCC Bridge	LRP048a	Ginlatoly	15.9	C	5.78			
N1	52.313	Box Culvert	LRP053a	AITAL BANGA BOX CULVERT	4.5	C	0.63			
N1	56.006	RCC Girder Bridge	LRP056a	Illot bazar Bridge	28.9	C	0.117			
N1	71.156	RCC Girder Bridge	LRP072a	Chandinian-Shahapara Bridge.	22.55	C	0.181			
N1	71.156	RCC Girder Bridge	LRP072a	CHANDINA- SHAHA PARA RCC GIRDER BRIDGE	23.1	C	1.88			
N1	78.382	Slab Culvert	LRP078a	KABILA DUBARICAR SLAB CULVERT	1	C	4.16			
N1	87.713	RCC Girder Bridge	LRP088a	Dhanpur Bridge	22.85	C	0.325			
N1	91.092	RCC Girder Bridge	LRP092a	Paduar Bazar Bridge	35.97	C	0.147			
					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.

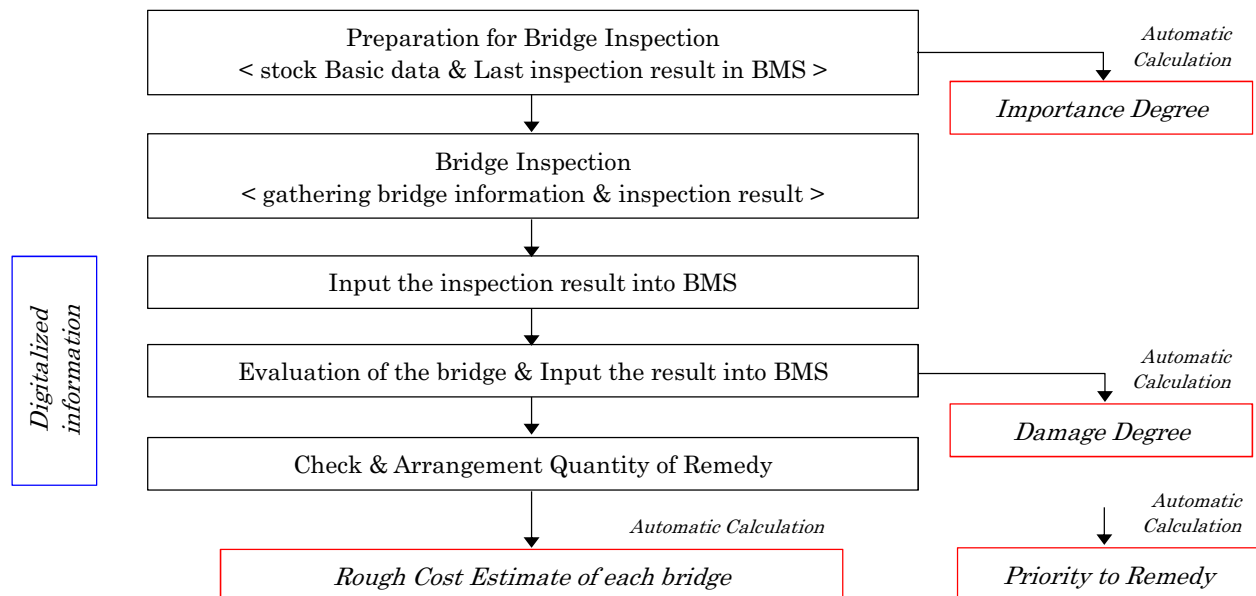
As the result of the interview, JICA project team decided to develop BMS as “New program”.

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		U	1	2	3	4
	User						
	Access						
Bridge Basic Data	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	✓	✓	✓	✓	✓	✓	

S L	5				6				7				8			
	Sr. Inspector				Chief Inspector				Evaluator				Committee			
	Delete	View	Edit	Add	Delete	View	Edit	Add	Delete	View	Edit	Add	Delete	View	Edit	Add
User	Access				Bridge Basic Data				Inspection				Evaluation			
	Draft	Need Cross Checking	Final	Blank Sheets	Draft	Need Review	Need Approval	Unsigned	Final	Blank Sheets	Draft	Temporary Final	Recheck	Committee	Unsigned	Unsigned (Committee)
Remedy Measure	Draft	Final														
Remedy list	Hidden	Shown														

2				1				0				9				8			
Committee Chair				Member of the committee				BMW officials				BMW Administration				User			
Delete	View	Edit	Add	Delete	View	Edit	Add	Delete	View	Edit	Add	Delete	View	Edit	Add	Access	Bridge Basic Data		
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	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			

13				18	
Public				User	
Delete	View	Edit	Add	Access	
.	.	.	.	Draft	Bridge Basic Data
.	.	.	.	Need Cross Checking	
.	✓	.	.	Final	
.	.	.	.	Blank Sheets	Inspection
.	.	.	.	Draft	
.	.	.	.	Need Review	
.	.	.	.	Need Approval	
.	.	.	.	Unsigned	
.	.	.	.	Final	
.	.	.	.	Blank Sheets	Evaluation
.	.	.	.	Draft	
.	.	.	.	Temporary Final	
.	.	.	.	Recheck	
.	.	.	.	Committee	
.	.	.	.	Unsigned	
.	.	.	.	Unsigned (Committee)	
.	.	.	.	Final	
.	.	.	.	Draft	Remedy Measure
.	.	.	.	Final	
.	.	.	.	Hidden	Remedy list
.	.	.	.	Shown	

3.2 BMS function which Each User can Use

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
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	✓	✓	✓	✓	✓	✓	✓	–	–	✓	–
4	Bridge Inspection	9	Prepare Bridge Inspection Sheet	✓	–	–	✓	✓	–	–	–	–	–	–
		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 stop 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
		Add bridge description or historical data
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 inputted 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. This 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. This 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

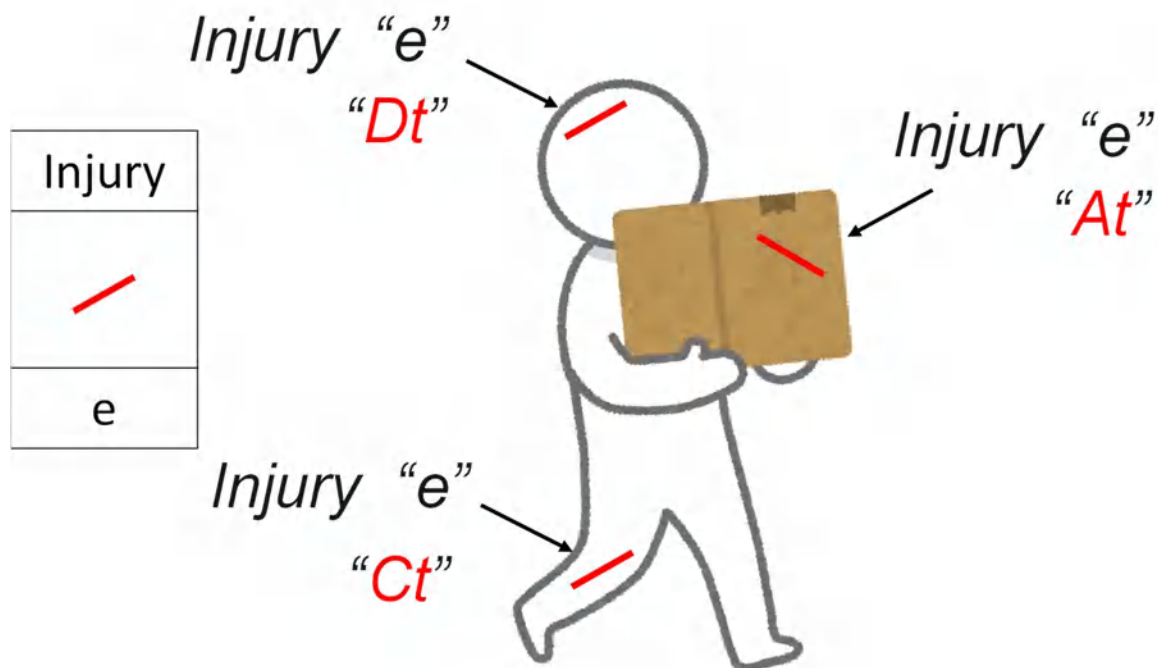
: Inspector only records “location and scale of defects” and “Rating of Defects” comparing with the defects and Inspection manual.

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”]

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

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.

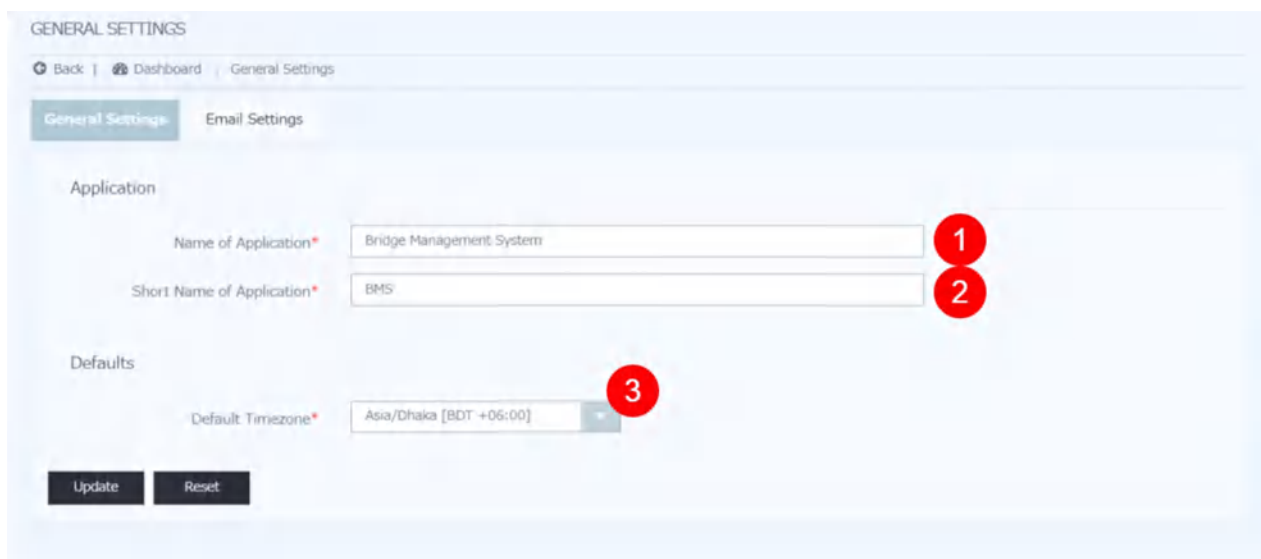
Only System Admin can access and arrange this function.

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.



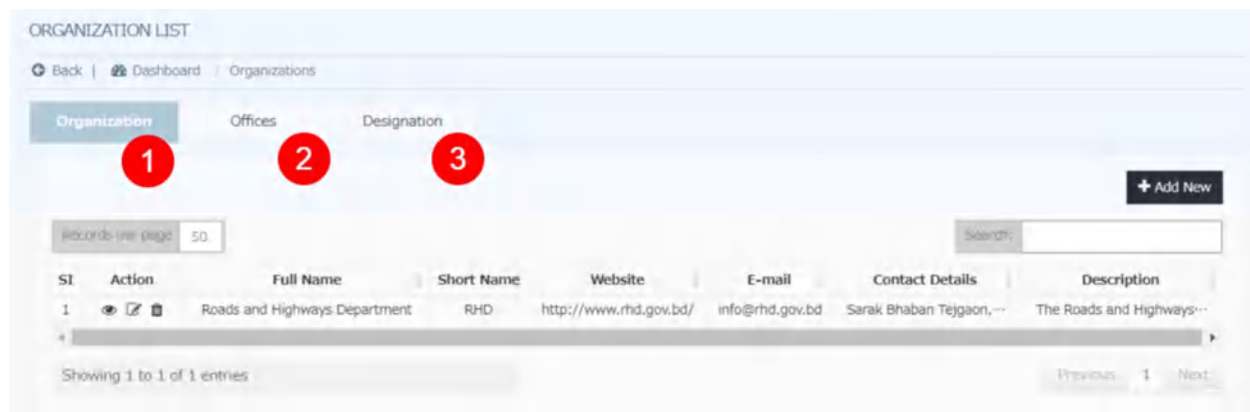
SL	Name of Function	Remark
1	Name of Application	Enter this system name.
2	Short Name of Application	Enter short name of this system.
3	Default Timezone	Choose Time zone. (Asia/Dhaka)

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.



5.2.1. Organization

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

5.2.2. Offices

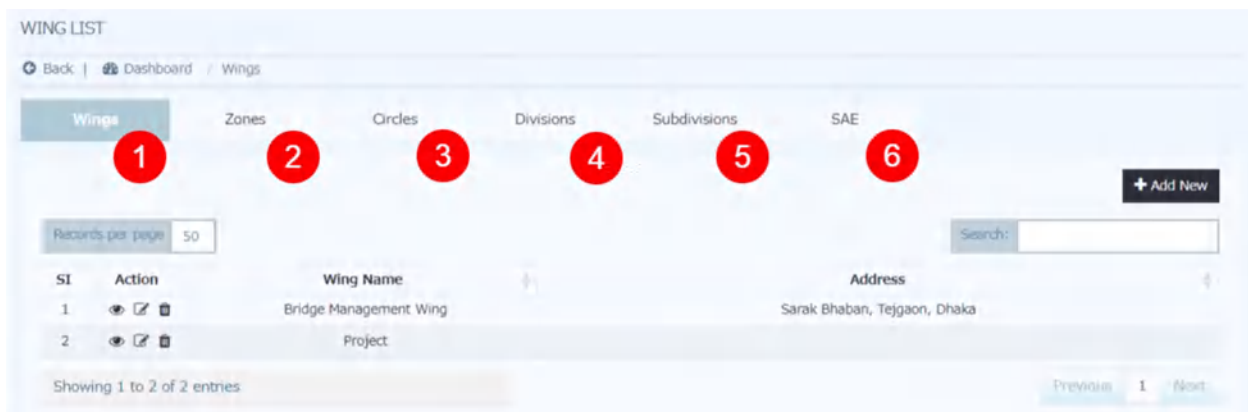
In “Offices”, System Admin can register office information like as Dhaka Division.

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”.



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

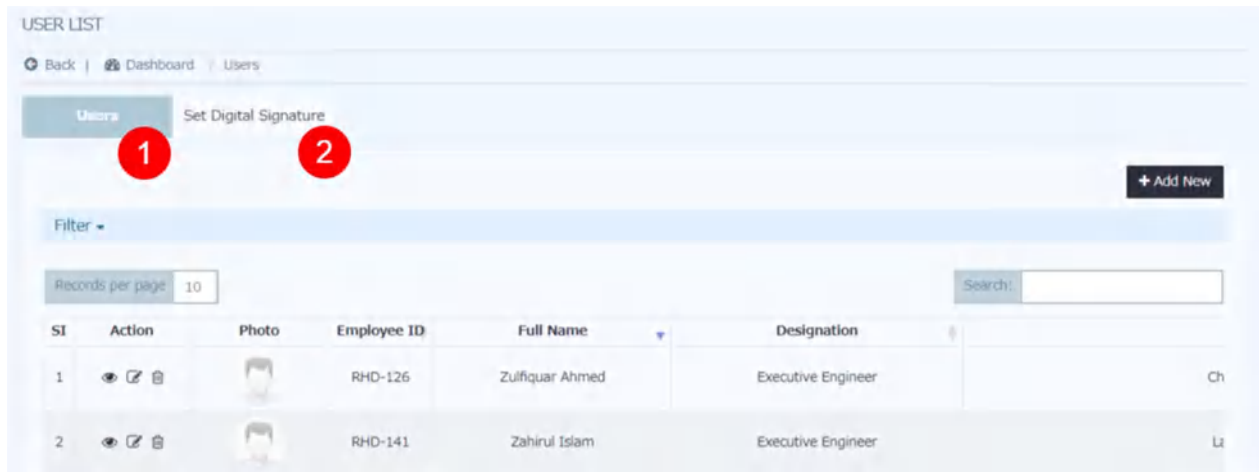
In “Subdivisions”, System Admin can register Subdivision offices. Each Division office is made a connection with a Division office.

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”.



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”

ROLE EDIT

Back | Dashboard / Roles / Edit

Role

Role Name* 1
System Admin

Description
BMS System Administrator

Remaining Characters 176

Access Control List 2

#	Module	List
1	Dashboard	☒ Bar Chart ☒ Bridge By Subdivision ☒ Pie Chart ☒ Bridge by length ☒ Bridge By Zone
2	Bridge	☒ Add ☒ Edit ☒ Inventory View ☒ Download Bridge List ☒ Delete ☒ Details View
3	Inspections	☒ <i>Periodic Inspection</i> ☒ New Sheet ☒ Edit Sheet ☒ Delete Sheet ☒ Result Sheet ☒ Inspection Form ☒ Add Detail ☒ Edit Detail ☒ Delete Detail ☒ Investigation ☒ Periodic Approved ☒ Periodic Approval ☒ <i>Routine Inspection</i>

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”.

The screenshot shows the 'BRIDGE TYPE CATEGORY LIST' interface. It features a top navigation bar with tabs: Bridge Type Category (1), Types (2), Components (3), Materials (4), Elements (5), Crossings Under Bridge (6), and Crossing / Utility (7). Below the tabs are sub-tabs: Traffic Volumes (8), Design Standards (9), Live Load Conditions (10), Road Classes (11), Road No. (12), and Measurement Units (13). A table lists bridge types with columns for SI, Action, Name, Materials, and Description. The table includes entries for Box Culvert, Concrete Bridge, Masonry Bridge, MIS Category, Mixed Material Bridge, and Steel Bridge. A search bar and a table with 6 entries are also visible.

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”.

DEFECT LIST

Back | Dashboard / Defect

Defects (1) Rating of Defects (2)

+ Add New

Records per page: 10

Search:

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

Showing 1 to 10 of 26 entries

Previous 1 2 3 Next

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

Elements
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		
☒ 1. Corrosion	0.60	3.00	3.00	209 (Height of Main Girder x 2) + (Width of Main Girder x 2)	209 (Height of Main Girder x 2) + (Width of Main Girder x 2)
☒ 2. Crack in Steel	1.00	1.00	1.00	101	101
☒ 3. Loose or Missing Bolts	0.20	Quant	Quant	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.

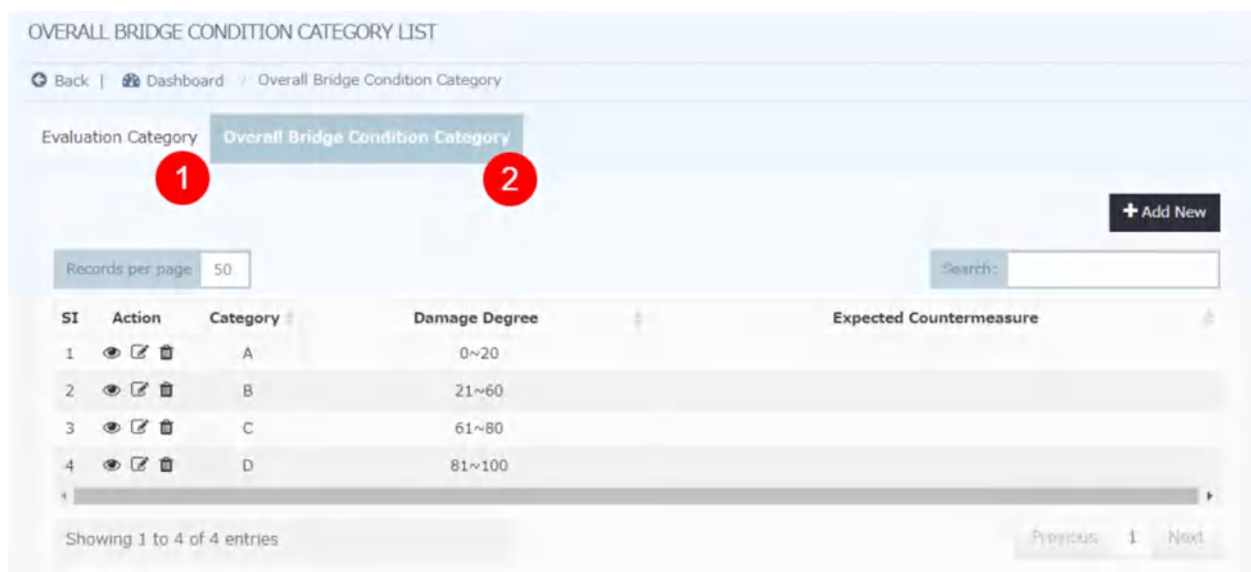
```
/** Quantity rule list for ct */
$config['quantity_rules_no_ct'] = array(
    '101' => 'Fix',
    '102' => 'Span Length',
    '103' => 'Effective Width',
    '104' => 'Effective Width x Span Length',
    '105' => 'Bridge Width',
    '201' => 'Interval of Main Girder',
    '202' => 'Interval of Main 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”.



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

2 x RC x PC x Concrete

Cancel

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

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

Records per page: 10

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	

+ Add New

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

Element

Main Girder

Main Girder (Element) - Defects

Steel

Defect

Ct (Remedial Measure)

Dt (Remedial Measure)

1. Corrosion

2. Crack in Steel

11. Repainting of Steel Member

12. Stop hole+Supplementing Steel

10. Supplementing Steel Plate

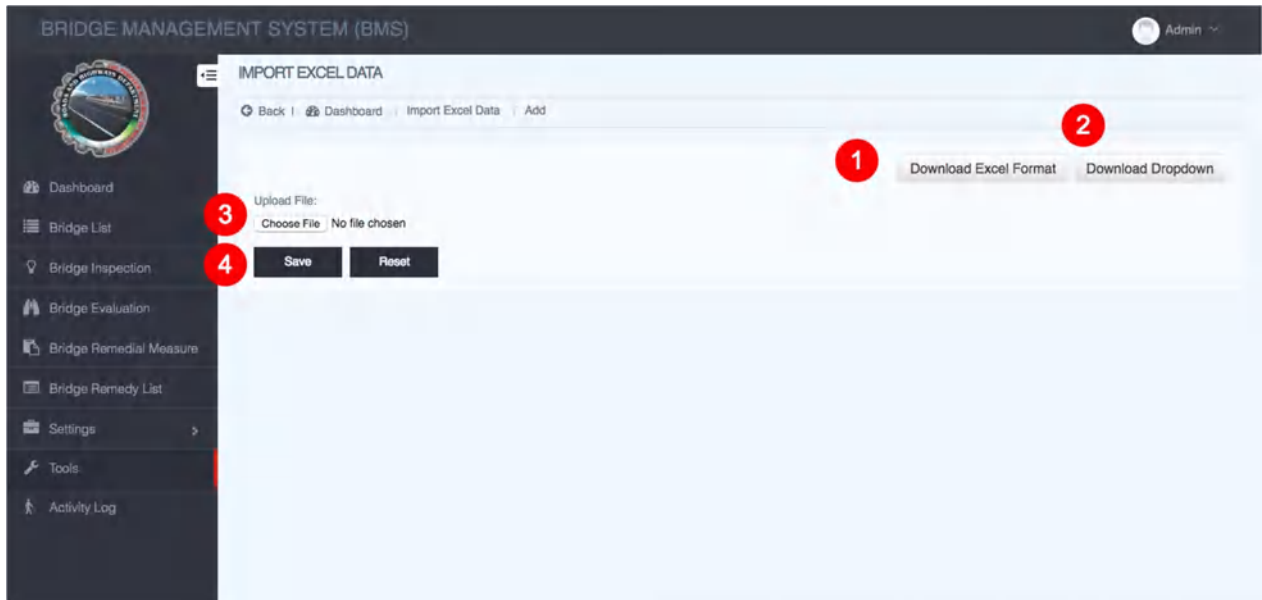
12. Stop hole+Supplementing Steel

SL	Name of Function	Remark
1	Elements	Choose targeted element.
2	Defects	Click the check box to be 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

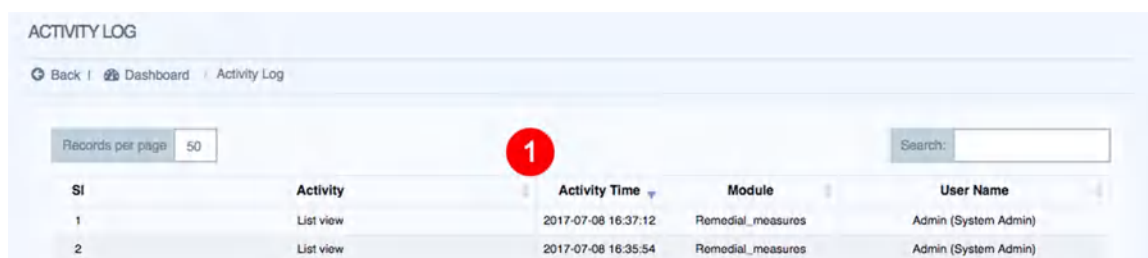
This feature is used to upload bulk bridge data into BMS database. User must download the templates first then input all necessary data into excel file and upload both sheets.



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.



1. View activity log

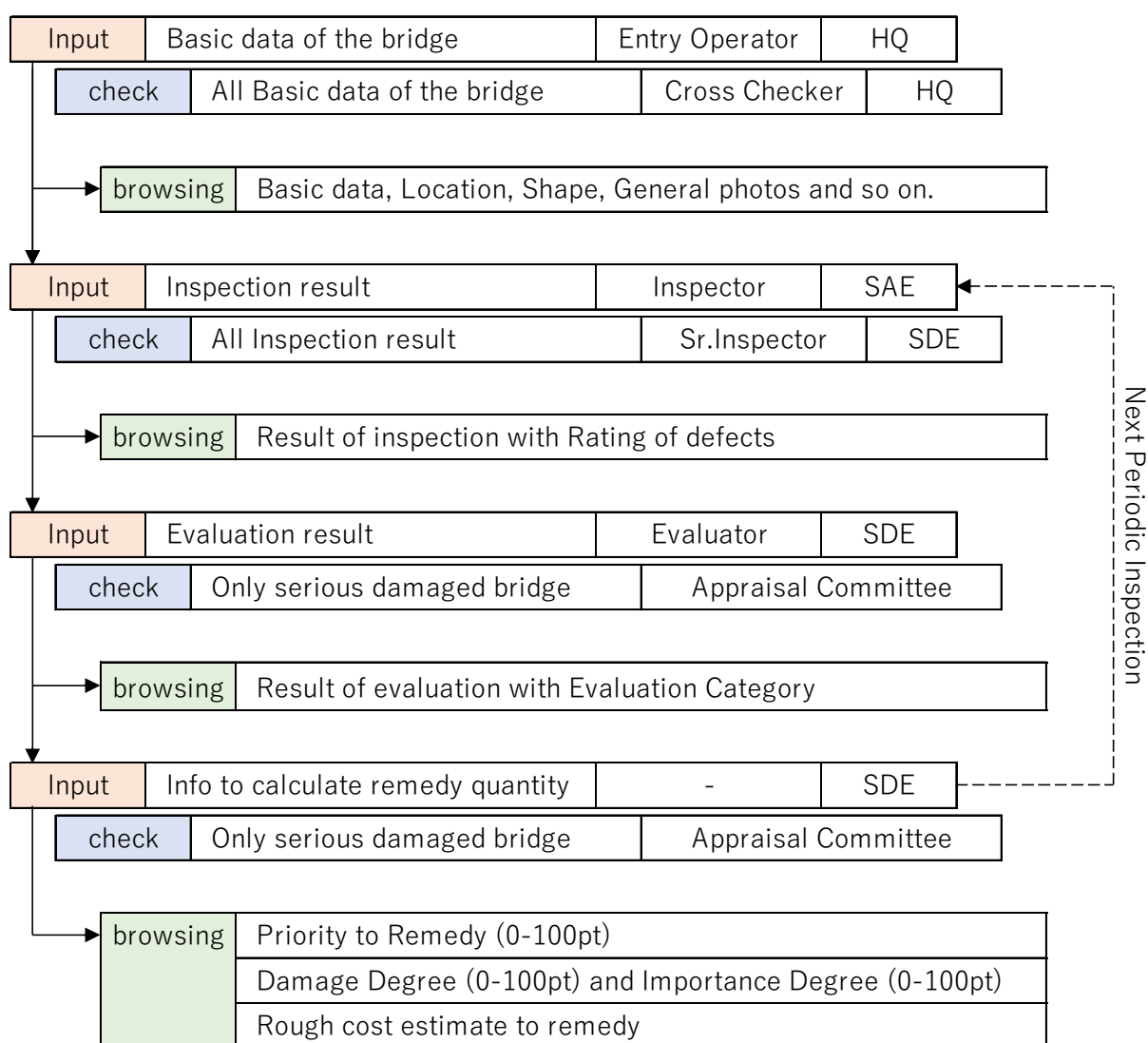
6. HOW TO USE BMS FOR EACH STEP (PERIODIC)

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.

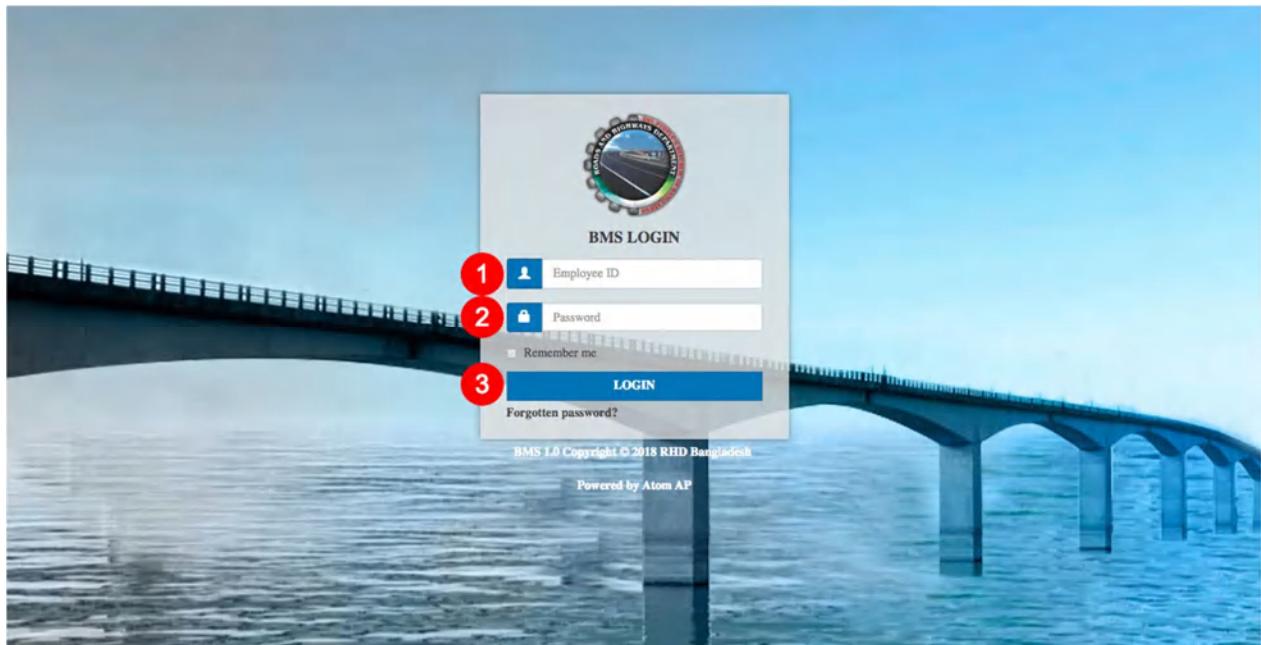


HQ : System section in Head Quarter

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 -

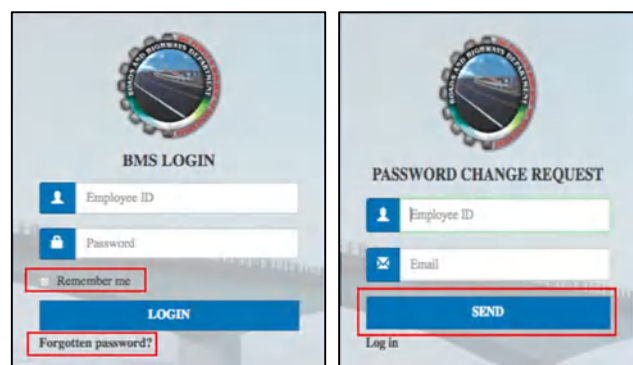
1. Enter valid **Employee ID**

2. Enter **Password**

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

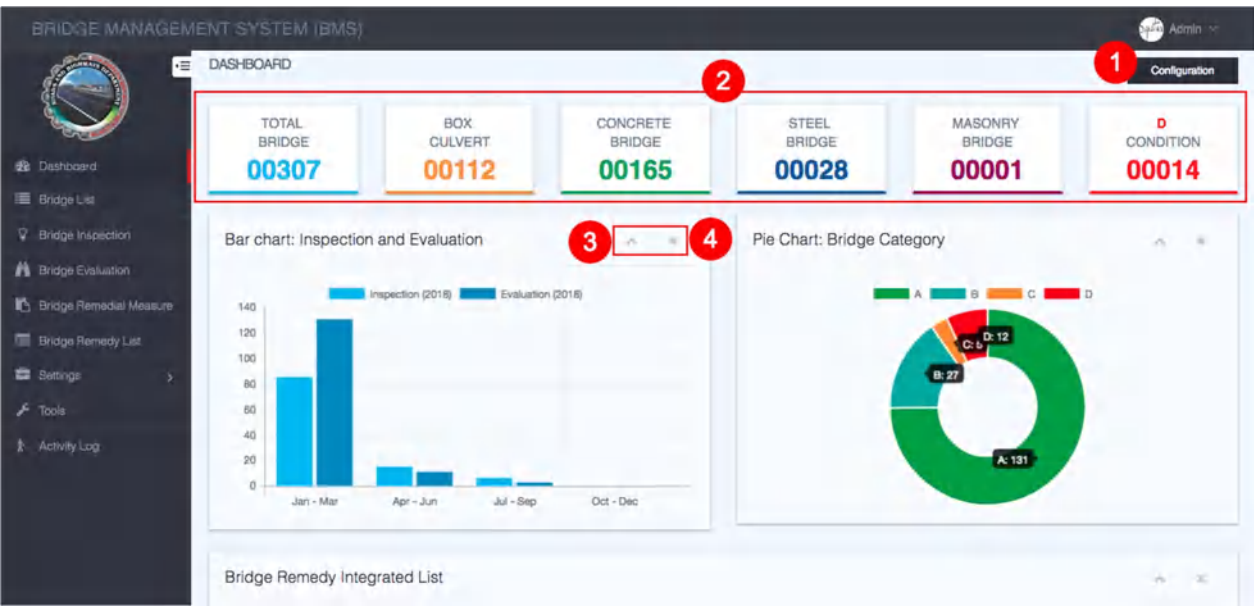
Remember Me: Click on this checkbox to remember the login information into browser.

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.



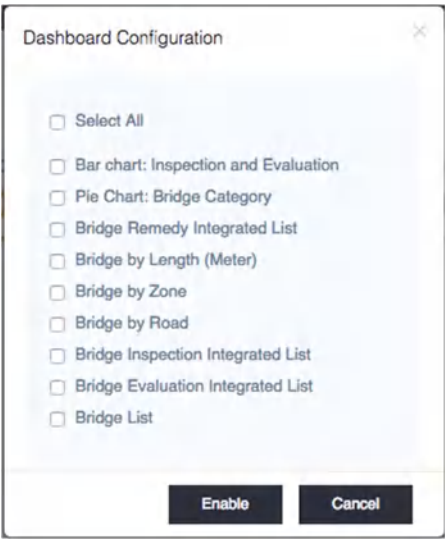
6.3 Dashboard

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”**.

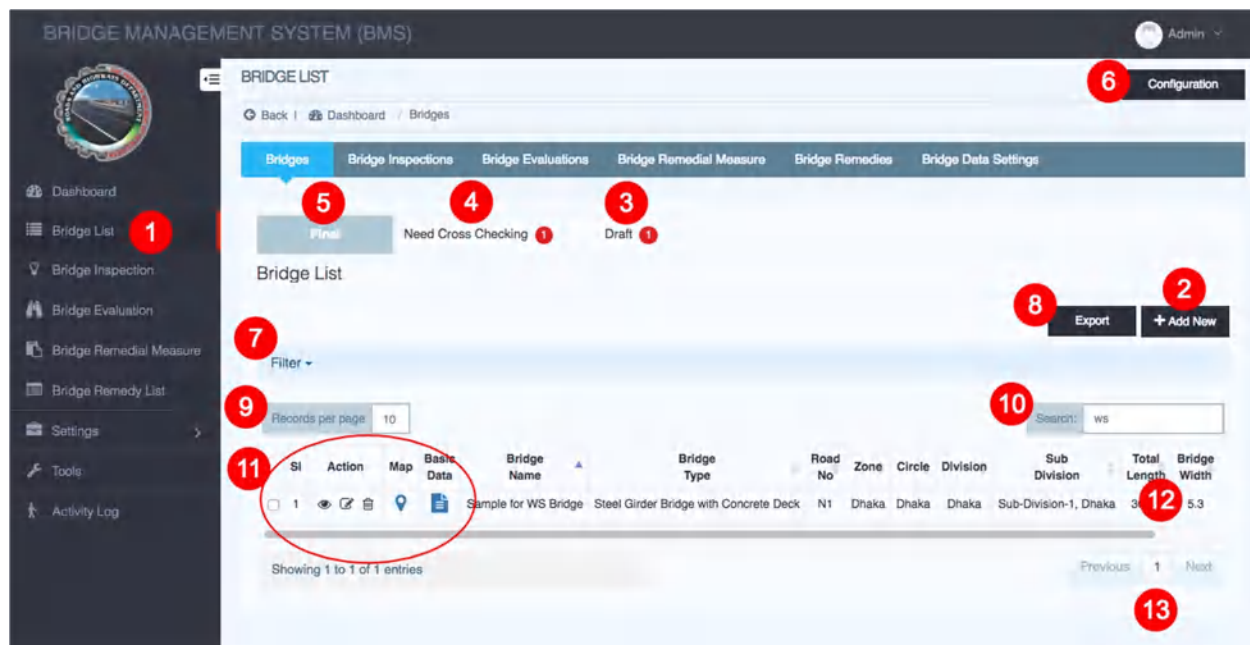


2. This section shows an overview of the data available in BMS.
3. To minimize the section click on this ^ button. To maximize the section views again click on this button.
4. To close any section click on this x button. To re-enable that section follow the steps in number 1 (Configuration).

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:
 - **Checkbox:** Click this checkbox to select/unselect any bridge.
 - **Eye Icon:** Click this icon to view bridge data.
 - **Edit Icon:** Click this icon to open bridge data in edit mode.
 - **Recycle Bin Icon:** Click this to delete a single bridge data.
 - **Location Icon:** Click this icon to see the bridge location in google map.
 - **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

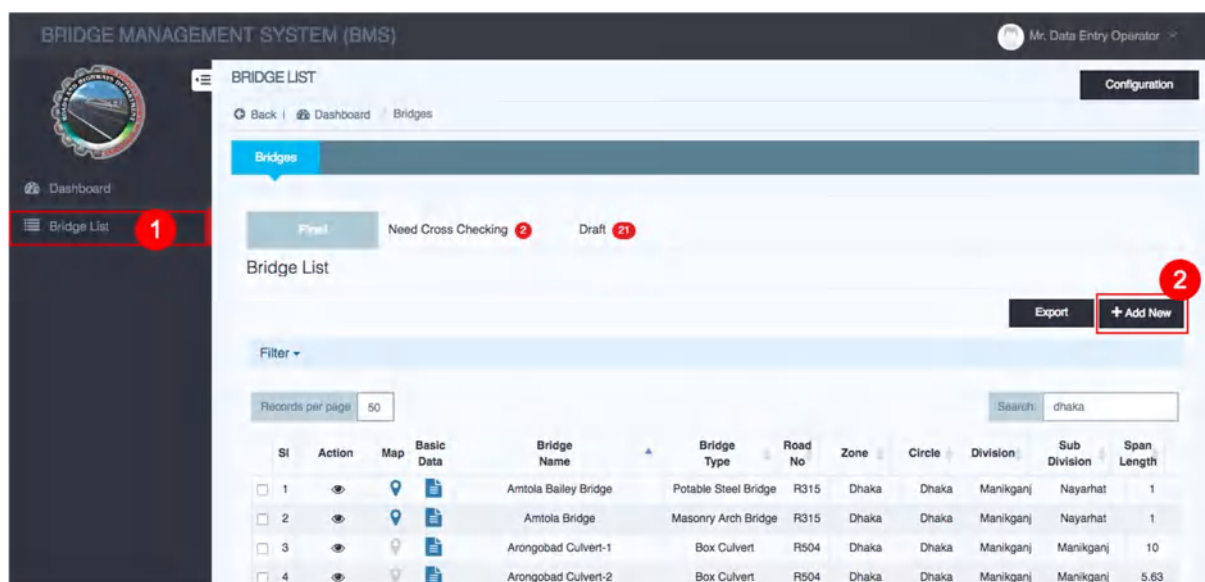
6.4.3. Step-by-step instruction for Data Entry Operator

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



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 web form titled 'Bridge Data tab'. It has a header with tabs: 'Basic Info', 'Shape', 'Road', 'Location', 'Element', and 'Pictures'. The 'Basic Info' tab is active. The form is divided into two columns. The left column contains fields for: 1. Bridge No* (with a placeholder for GPS coordinates), 3. Bridge Type* (dropdown), 5. Reconstructed Year (with a calendar icon), 7. Design Load, 9. Crossing & Public Utility (dropdown), 11. Bridge Owner, and 12. Description (with a rich text editor). The right column contains fields for: 2. Bridge Name* (with a note about capital letters), 4. Completion Year* (with a calendar icon), 6. Design Standard (dropdown), 8. Load Restriction, and 10. Crossing Under Bridge* (dropdown). At the bottom, there is a 'Public view' checkbox and three 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 stream side” and “down stream side”. If the bridge locates upper stream side, add “1” as 13th letter. If down stream 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 x

Information Of Water pipe :

a water pipe (owner is unknown) is attached under girde x

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 Input to one decimal place (e.g. 12.0)	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) Input to three decimal places (e.g. 12.000)	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) Input to three decimal places (e.g. 12.000)	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) Input to three decimal places (e.g. 12.000)	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)				
☐ Public View					
Save Reset					

Note

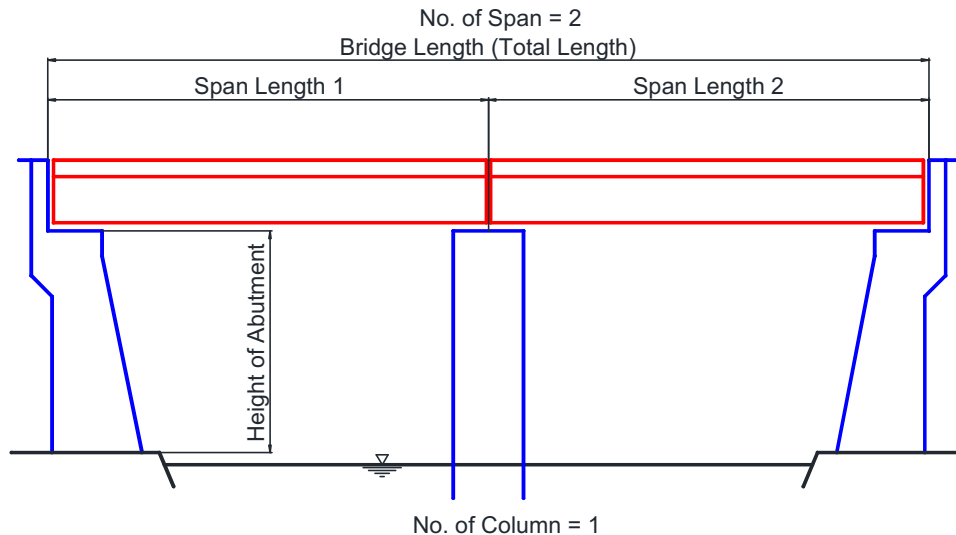
- Each length should be inputted by three decimal places. (e.g. 0.500, 3.125, 30.000)
- When you choose "Box Culvert" in Bridge Data tab, inputting cells in Shape tab are set for culvert automatically.

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.

Span wise span length settings	
Span-1	Span-2
25.000	35.000



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.

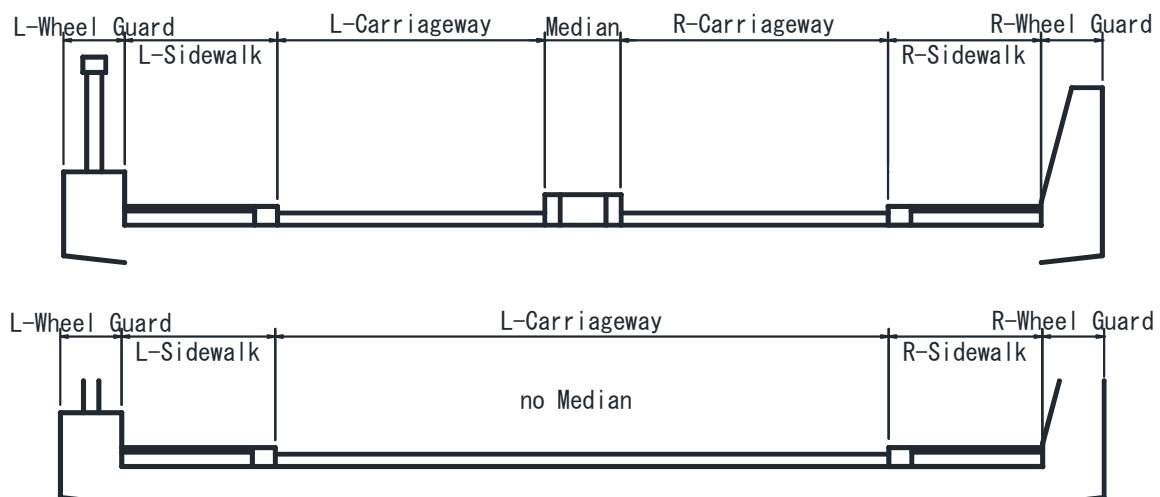
2. Bridge Width*, 3. Bridge Effective Width*,

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

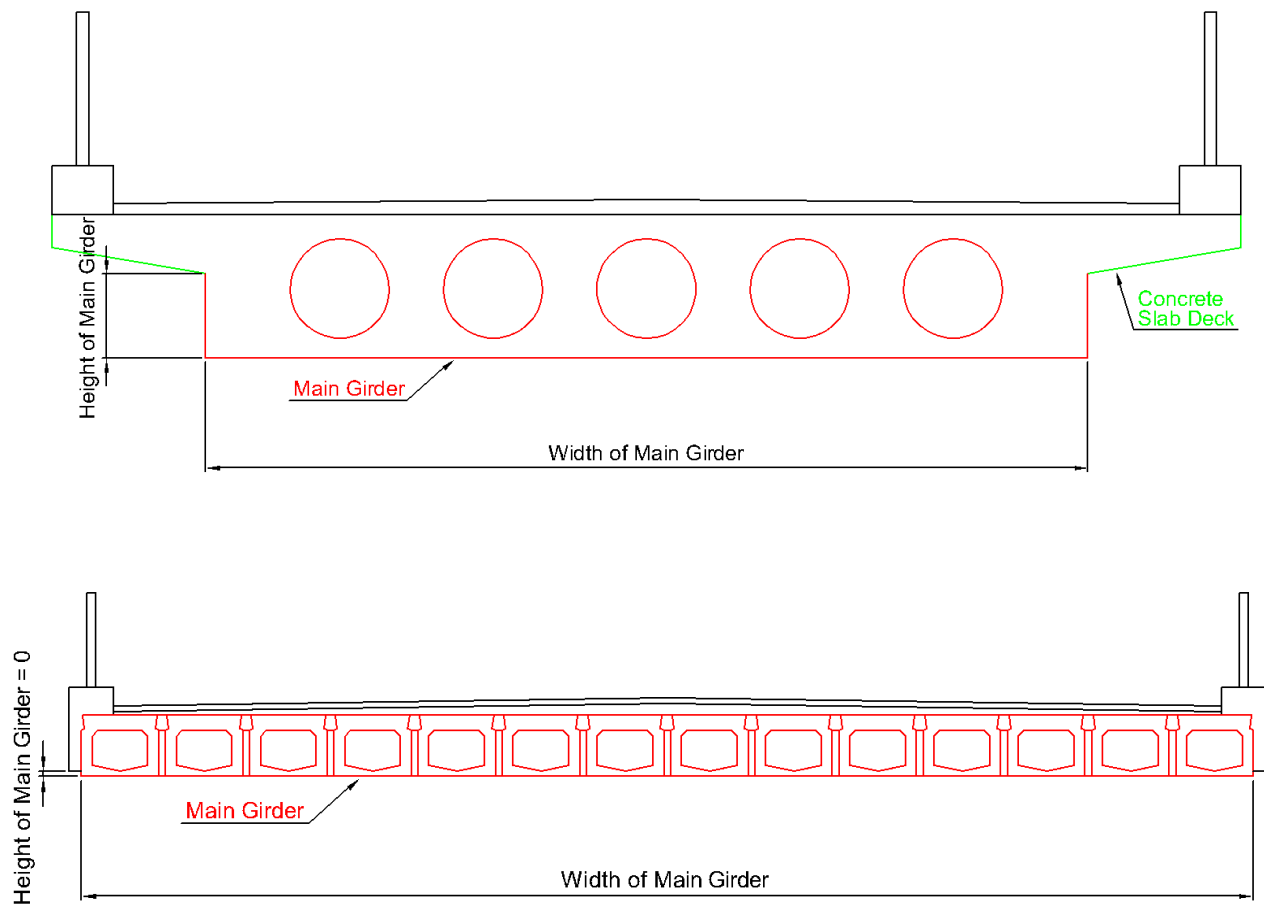
[Temporary Input **after 1st Periodic Inspection** of the bridge]

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]



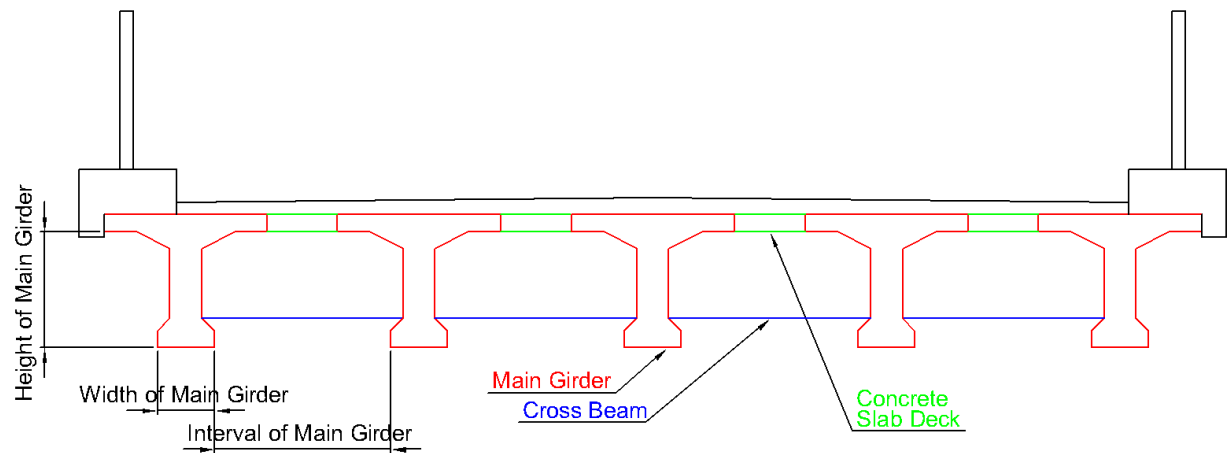
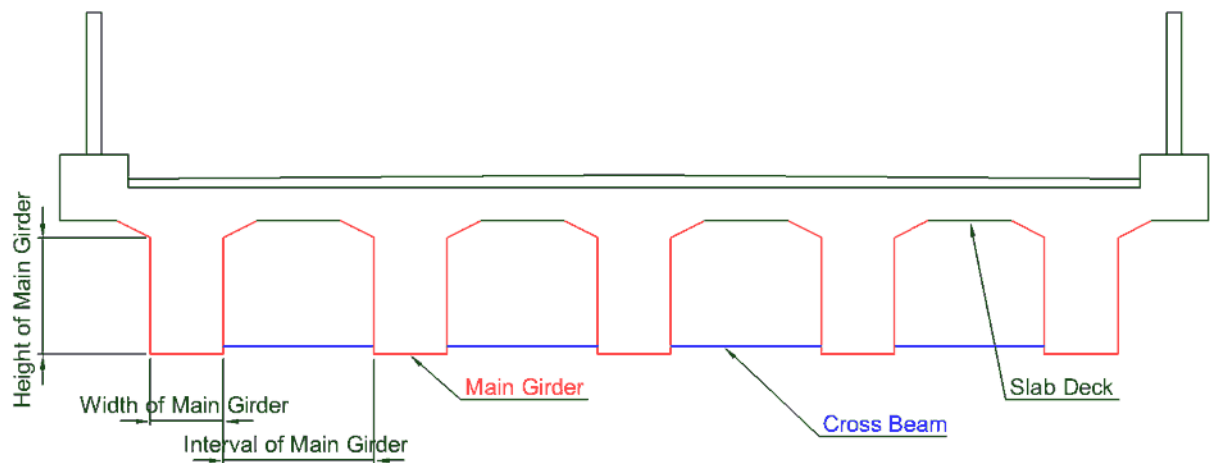
- Interval of Main Girder : input always "0".
- Height of Main Girder : Temporary = "0"
- Width of Main Girder : Temporary = "Effective Width"

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]



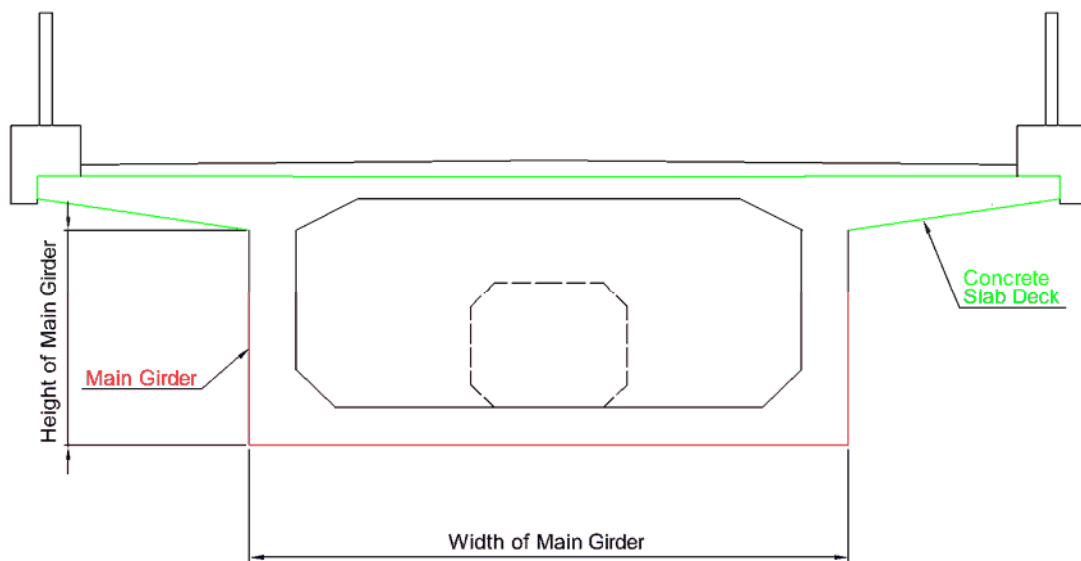
- Interval of Main Girder : Temporary = “Effective Width” / (“NO. of Main Girder” - 1)
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = 0.300 m

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]



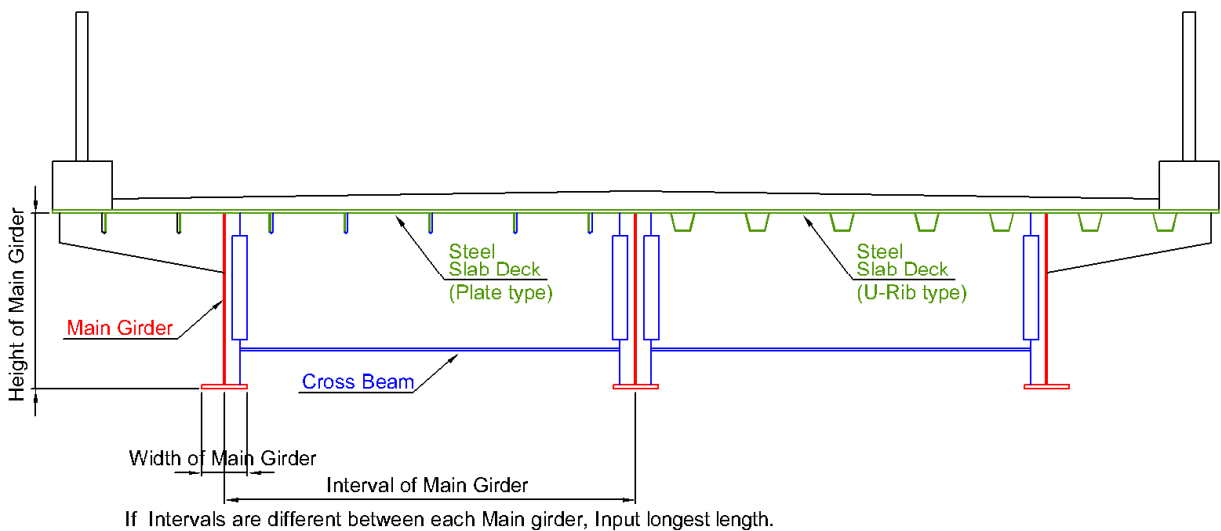
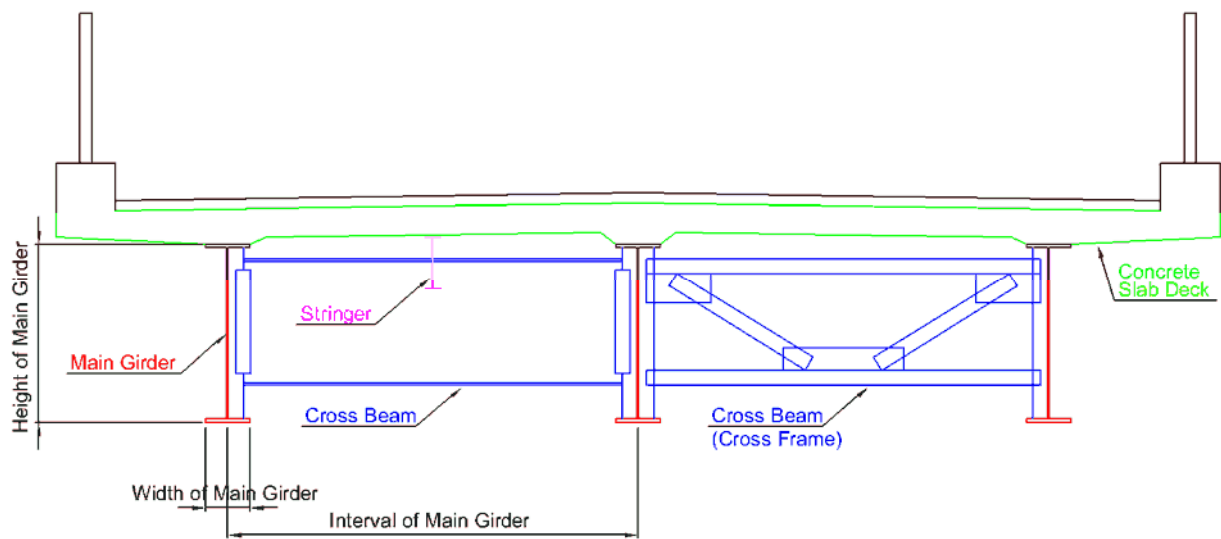
- Interval of Main Girder : input always "0"
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : "Effective Width"

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]



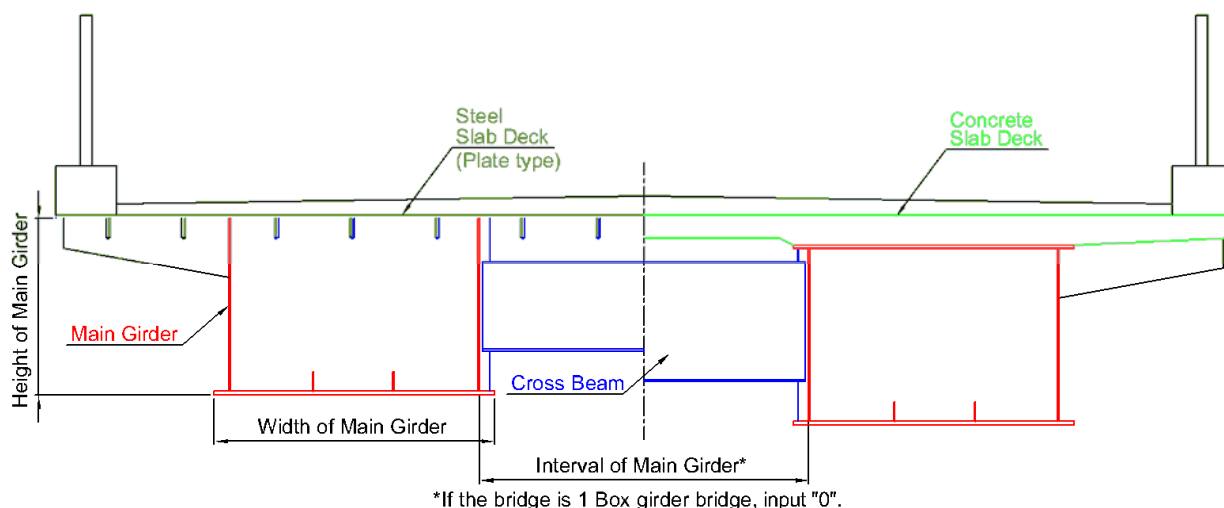
- Interval of Main Girder : Temporary = "Effective Width" / "NO. of Main Girder"
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : Temporary = "Height of Main Girder" / 5

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 =
"Effective Width" - "Width of Main Girder" x "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)

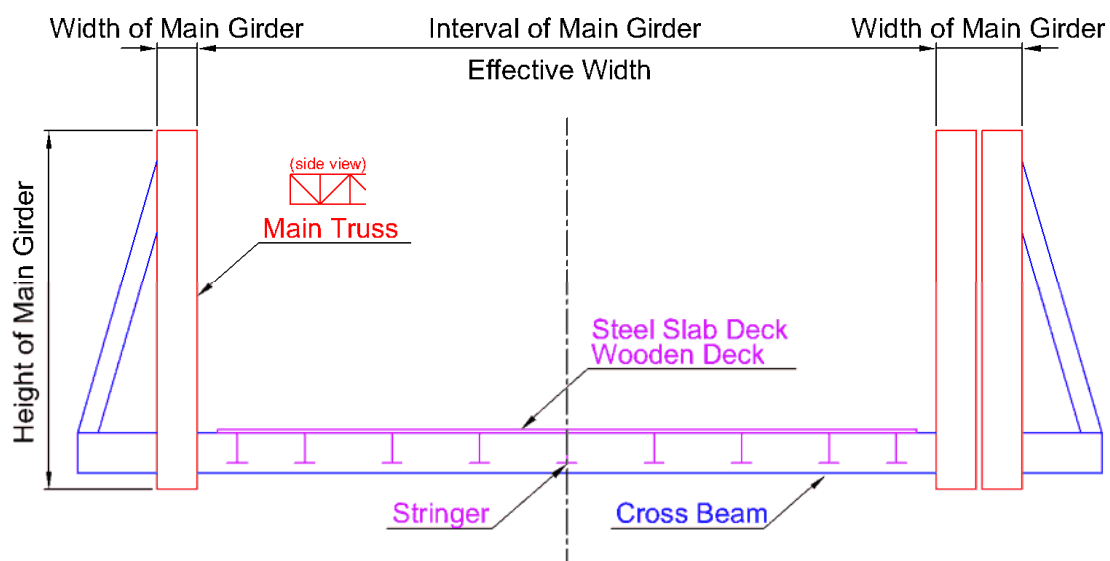
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : Temporary = "Effective Width"
- Interval of Main Girder : input always "0"

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]

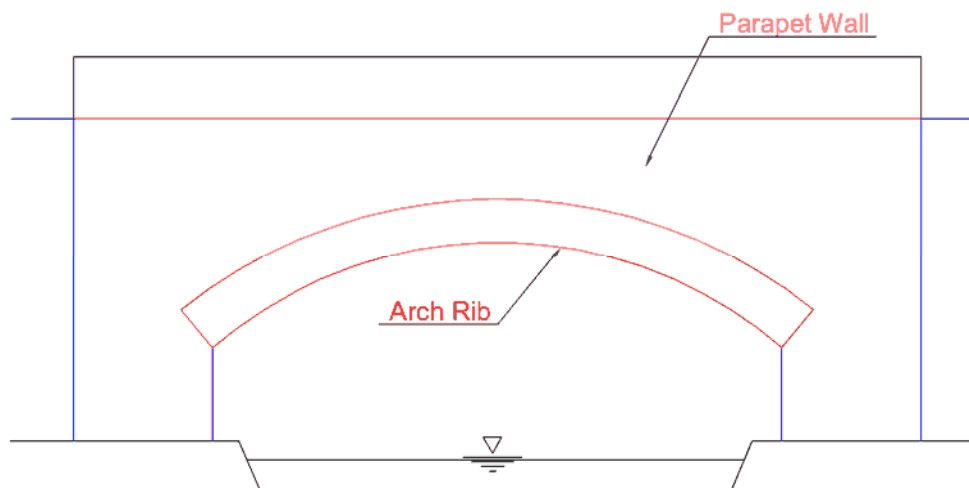


- Interval of Main Girder : always same as “Effective Width”.
- Height of Main Girder : Temporary = 2.000 m
- Width of Main Girder : Temporary = 0.200 m

[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



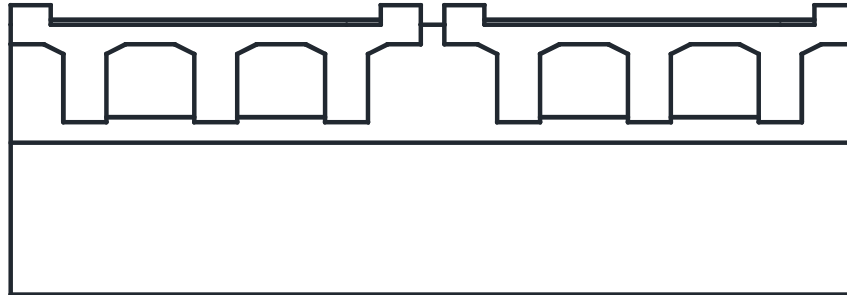
Because only a type of bridge is enabled into BMS, this type is required to manage BMS.

Note

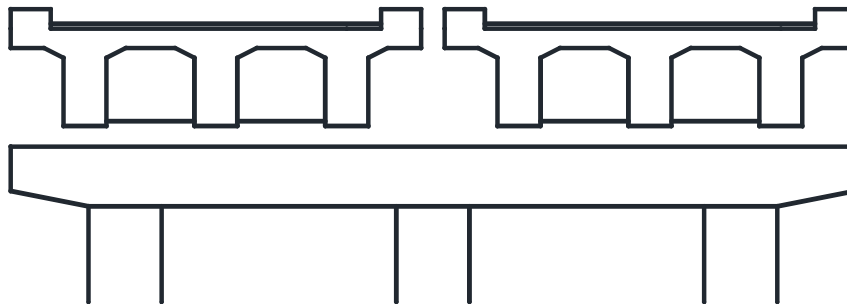
- Number of Main Girder, cross beam and so on of Basic Data should be inputted as maximum number of main girder in all spans.
 - Inspection sheet and Evaluation sheet of Mixed Types Bridge consist of “All types of defects” (both of types of defects of “Concrete” or “Steel (rubber)”).
- Cells of inspection 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.

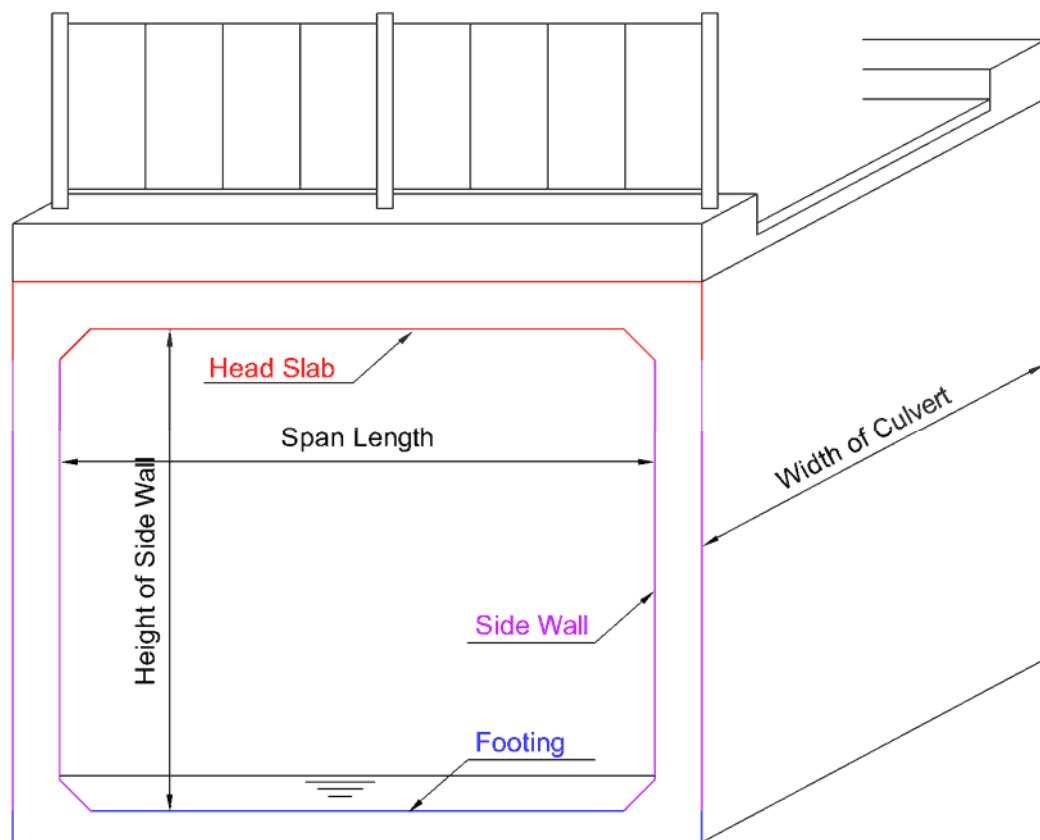
[Temporary Input **after 1st Periodic Inspection** of the bridge]

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).

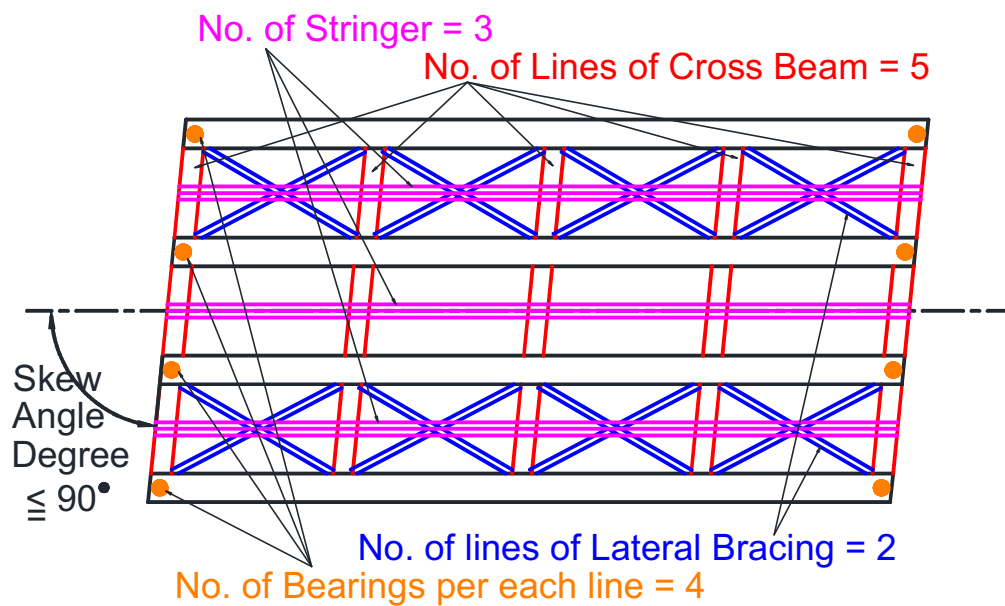
24. No. of Lines of Cross Beam (except Box Culvert)

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

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

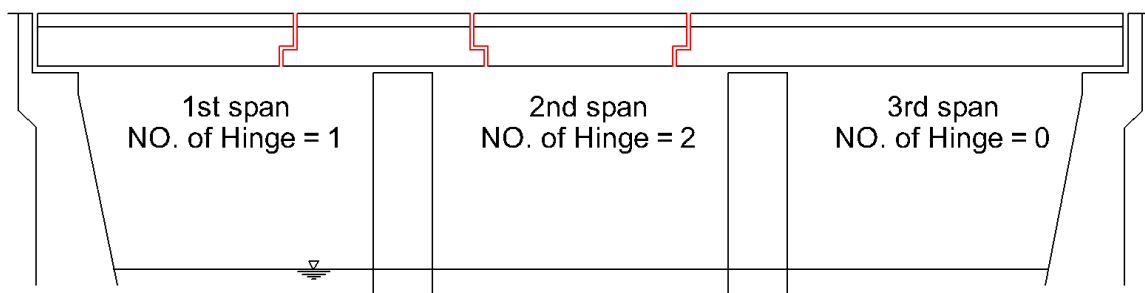
28. No. of Lines of Lateral Bracing (Steel Girder Bridge)

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					
☐ Public View					
Save		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.

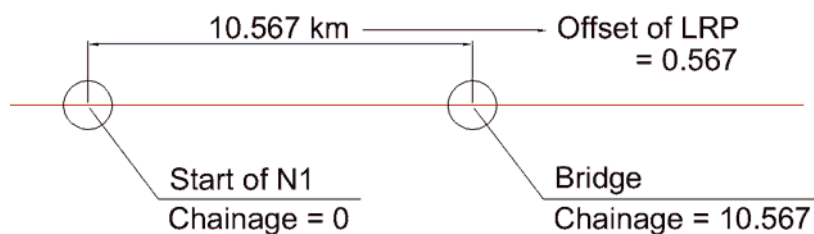
5. New LRP Name

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

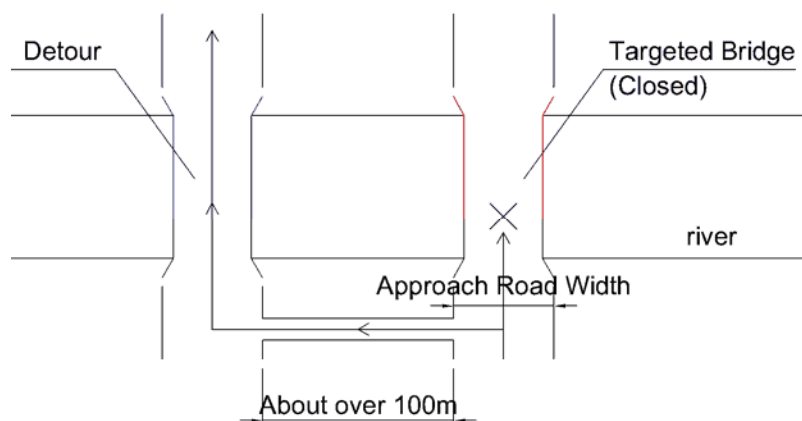
Input number of traffic lanes on the bridge. (same as "16. Lanes On Structure" in Shape)

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

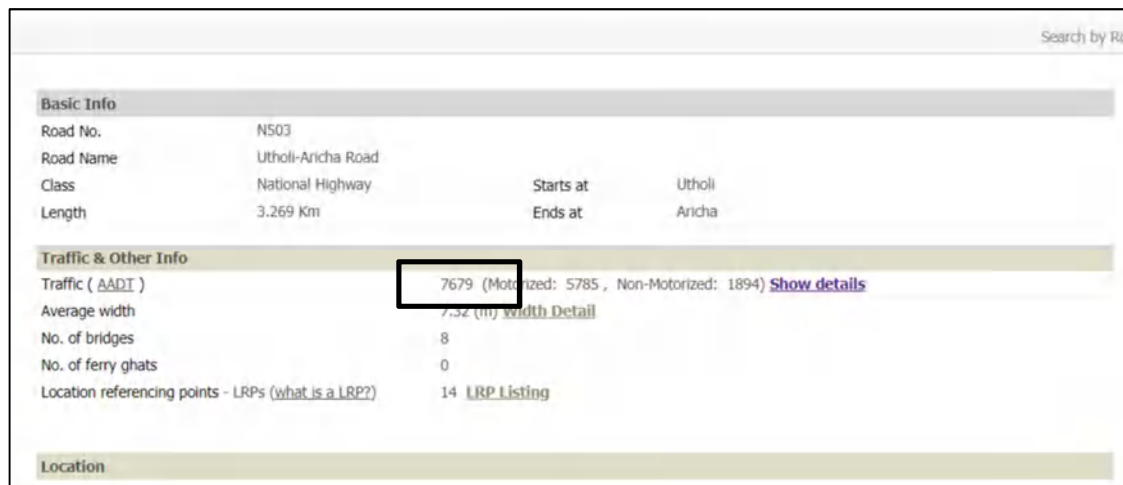
Choose range of Traffic Volume of the bridge.

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).



Search by Road			
Basic Info			
Road No.	NS03		
Road Name	Utholi-Aricha Road		
Class	National Highway	Starts at	Utholi
Length	3.269 Km	Ends at	Aricha
Traffic & Other Info			
Traffic (AADT)	7679 (Motorized: 5785 , Non-Motorized: 1894) Show details		
Average width	7.32 (m) width Detail		
No. of bridges	8		
No. of ferry ghats	0		
Location referencing points - LRPs (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>

The screenshot shows a web form titled 'Location' with the following fields:

- 1. Zone***: A dropdown menu with a '-- Select --' option.
- 2. Circle***: A dropdown menu with a '-- Select --' option.
- 3. Division***: A dropdown menu with a '-- Select --' option.
- 4. Sub Division***: A dropdown menu with a '-- Select --' option.
- 5. SAE***: A dropdown menu with a '-- Select --' option.
- 6. District**: A text input field with the placeholder 'If you don't know, keep blank'.
- 7. Upazilla**: A text input field with the placeholder 'If you don't know, keep blank'.
- 8. Union**: A text input field with the placeholder 'If you don't know, keep blank'.
- 9. Village**: A text input field with the placeholder 'If you don't know, keep blank'.
- 10. Country**: A text input field with the placeholder 'If you don't know, keep blank'.
- 11. GPS Latitude**: Three text input fields for 'Degree', 'Minute', and 'Second', each with the placeholder 'If you don't know, keep blank (input after)'.
- 12. GPS Longitude**: Three text input fields for 'Degree', 'Minute', and 'Second', each with the placeholder 'If you don't know, keep blank (input after)'.
- Reference Level**: A text input field with the placeholder 'Reference Level'.
- Public View**: A checkbox.
- Buttons**: 'Save' and 'Reset' buttons.

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 InfoShapeRoadLocationElementPictures

Superstructure

☒ Main Girder

3

☒ Main Girder Hinge

2

☒ Cross Beam

12

☒ Deck Slab (Concrete)

RC

4

☐ Stringer

☐ Main Truss

☐ Main Arch

☐ Outer Cable

☐ Main Tower

☐ Head Slab

☐ Lateral Bracing

☐ Deck Slab (PC)

☐ Deck Slab (Steel)

Select Element Type

☐ Arch Rib

☐ Parapet Wall

Substructure

☒ Pier

T-shaped Column Type

1

☒ Abutment

Gravity Type

2

☒ Foundation

Unknown

3

☐ Wing Wall

☐ Footing

☐ Side Wall

Bearings

☒ Bearing (Rubber)

Rubber

2

☒ Bearing Seat/Bed

2

☐ Bearing (Steel)

Select Element Type

2

☐ Anchor Bolts

Deck Surface

☒ Railing (Steel)

Steel

2

☒ Pavement

Asphalt

1

☒ Wheel Guard

2

☐ Railing (Concrete)

Select Element Type

☐ Curb

Drainage System

☒ Drainage System

1

Inspection Facilities

☒ Inspection Facility

1

Utilities

☒ Utility Pipe

1

Expansion Joint

☒ Expansion Joint (Steel)

Steel

3

☐ Expansion Joint (Rubber)

Select Element Type

3

Others

☒ Bridge Approaches

2

☒ Retaining Wall

2

☒ Road Sign

1

☒ Lighting Facility

1

☐ Public View

Cancel

Report

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**

1. Title* Max 25 characters

2. Order

3. Description Max 200 characters

4. Image*
Choose File No file chosen

Image Preview

☐ Feature Photo
By checking, this photo is displayed with mouseover the bridge name in Bridge List.

☐ Public View
By checking, this photo is opened to Public User

Save Reset

+ Add New Picture

Records per page 50 Search:

SI	Action	Order	Picture	Title	Feature Photo	Public Access	Description
1		1		test	Yes	Yes	

Showing 1 to 1 of 1 entries

Previous 1 Next

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**.

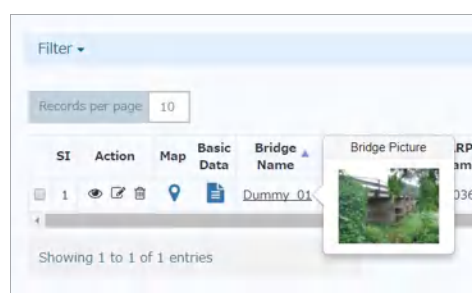
There are no limit size to upload. However, operation of BMS will be slow because of the too large sized picture.

Feature Photo Picture

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

Public View

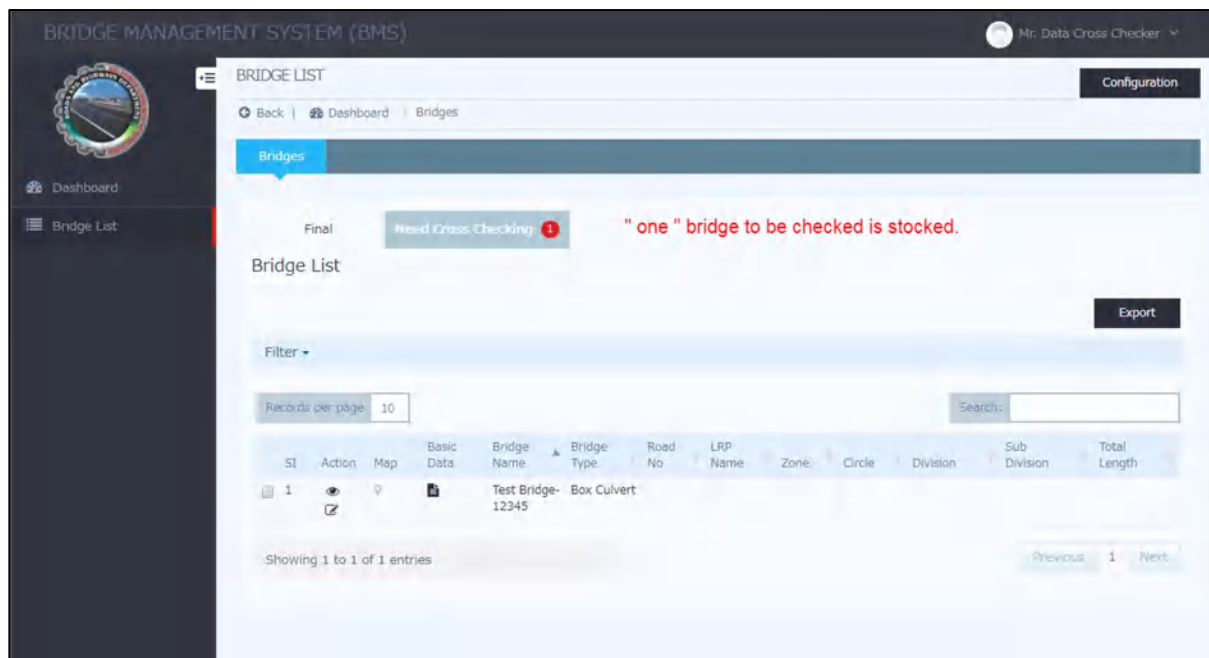
By clicking on this check box, the photo will is opened to Public Users.



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.

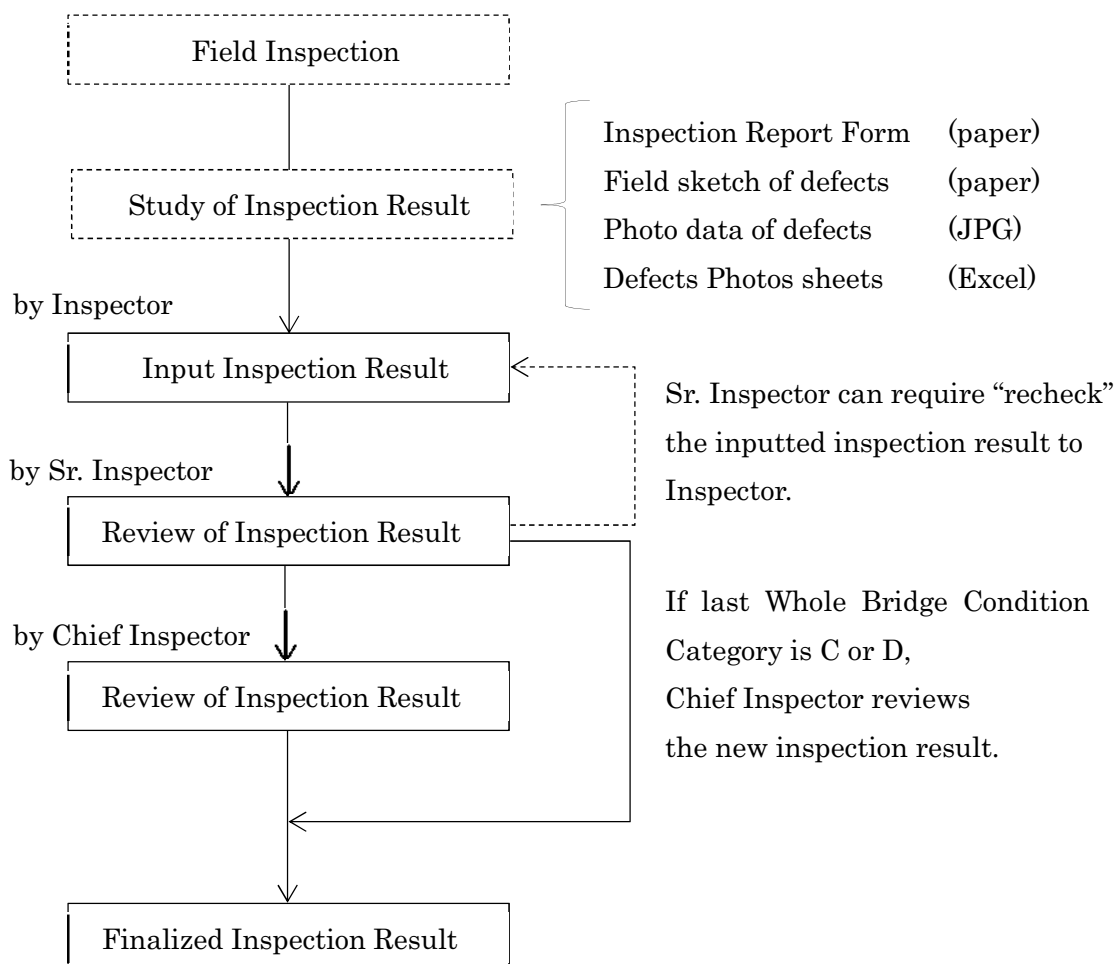


- Click “Bridge List”
- Click “Need Cross Checking”.
- Check all data inputted comparing with Paper of Bridge inventory sheet.
- Click “Edit” in each tab.
- If you found something to modify, edit it.
- Click “Save as final”.

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 INSPECTION LIST' page in the Bridge Management System (BMS). The interface includes a sidebar with navigation links and a main content area with tabs for different inspection stages. The 'Bridge Inspections' tab is selected, showing a list of inspection sheets. The list is organized into two sections: 'Periodic Inspection Integrated List' and 'Routine Inspection Integrated List'. Each section has a 'Filter' button and a 'View All' link. The 'Periodic Inspection Integrated List' shows two entries with columns for SI, Result Sheet, Report Form, Bridge Name, Bridge Type, Road No, LRP Name, Zone, Circle, Division, Sub-Division, and Map. The 'Routine Inspection Integrated List' shows one entry with similar columns. Numbered callouts (1-16) highlight specific features and actions on the page.

1. Click **“Prepare Inspection Sheet”**, Select **“Periodic”** and click create.
2. Click **“Blank Sheets”** to view all blank inspection sheets.
3. Click **“Draft”** to view all draft inspection sheets.
4. Click **“Submitted for Review”** to view all inspection sheets submitted for review.
5. Click **“For Approval”** to view all inspection sheets submitted for approval.
6. Click **“Unsigned”** to view all inspection sheets approved but unsigned.
7. Click **“Final”** to view all inspection sheets approved and signed.
8. Click **“Filter”** to filter inspection list.
9. By default most 10 recent inspections data will show. Click to view all inspection sheets.
10. User can change number of rows to show in list table. Example: 10, 25, 50, 100.
11. User can search bridge by any values of bridge data.
12. Click **“Export”** button to download inspection list in excel format.
13. Click **“Prepare Inspection Sheet”**, Select **“Periodic”** or **“Routine”** and click create.
14. 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.
15. Click **“Next”** to see next page. Click **“Previous”** to see previous page.
16. 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

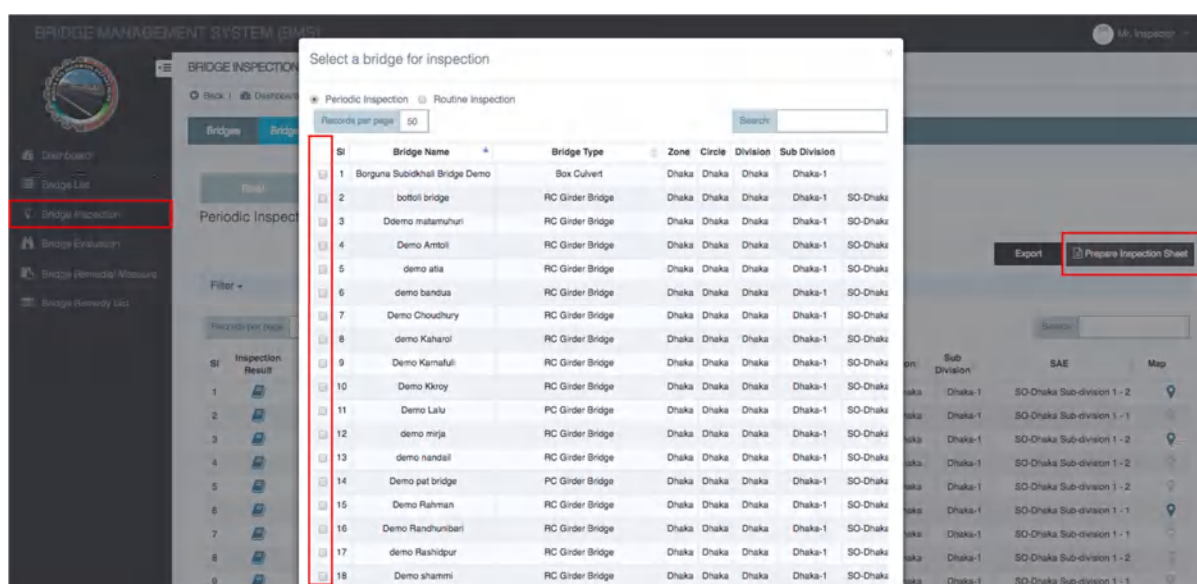
If you find bridge basic data to be modified during field inspection, you have to inform them to Sr. Inspector. After Sr. Inspector confirms and approve them, Sr. Inspector sends email to inform them with specified form to Data Entry Operator.

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



- Click “Prepare Inspection Sheet”.
- Choose “Targeted Bridge” in Periodic Inspection Integrated List and click “New Sheet”.
- Click “Print”. You can get the bridge inventory and last result of inspection of the bridge.
- 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

BRIDGE MANAGEMENT SYSTEM (BMS)

MR. Inspector

BRIDGE INSPECTION LIST

Back Dashboard Bridge Inspection

Bridges Bridge Inspections Bridge Evaluations Bridge Remedial Measure Bridge Remedies

Final Submitted For Review Draft **Blank Sheets**

Periodic Inspection Integrated List

Export Prepare Inspection Sheet

Filter -

Records per page 50

SI	Action	Inspection Result	Report Form	Inspection Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle	Division	Sub-Division	SAE	Map
1				2018-04-16	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 2	
2				2018-04-16	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 2	
3				2018-03-05	Mohasthan Bridge	RC Girder Bridge	N5	237.000	237	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 1	
4				2018-03-05	demo-atik	RC Girder Bridge	N5	36.679	BC036	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 1	
5				2018-03-05	Demo12345 @ Meghna	RC Girder Bridge		37.700	40a	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 1	
6				2018-03-05	Demo Kamaluli	RC Girder Bridge		0		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 1	
7				2018-03-05	Demo Kikroy	RC Girder Bridge	N5	5800.000	6	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 1	
8				2018-03-01	demo Rashidpur	RC Girder Bridge		112.250	112a	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 2	
9				2018-03-01	demo_kader	RC Girder Bridge	N2	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division 1 - 1	

- 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.

0% Inspection has been completed

100% input required to proceed to next step

1 2

Fill with "a"

File Number		INS-Z5064--20180416		Bridge Name		Test Maki 0413 Culvert		Superstructure		Box Culvert		Year		2050													
Zone		Dhaka		Circle		Dhaka		Division		Dhaka		Sub-division		Dhaka-1													
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															
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	Delamination	Abnormal Spacing	Difference in Level	Abnormal Bituminous Pavement	Functional Disorder of Basings	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
Head Slab		01																									
Footing		01																									
		02																									
Side Wall		01																									
		02																									

Input results in white box only

(g) Blanked Inspection sheet is displayed.

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

Rating of Defects

- “ - “ : Element doesn’t exist in this bridge.
- “ N “ : non visible.

< case 1 >

- “ a “ : no defect
- “ b “ : small defect
- “ c “ : medium defect
- “ d “ : large defect

< case2 >

- “ a “ : not existing
- “ 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.

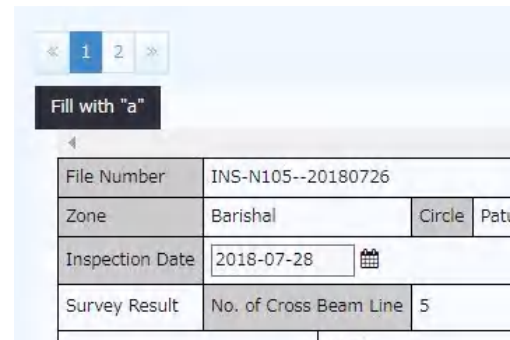
Inspection Picture Add window

- “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.



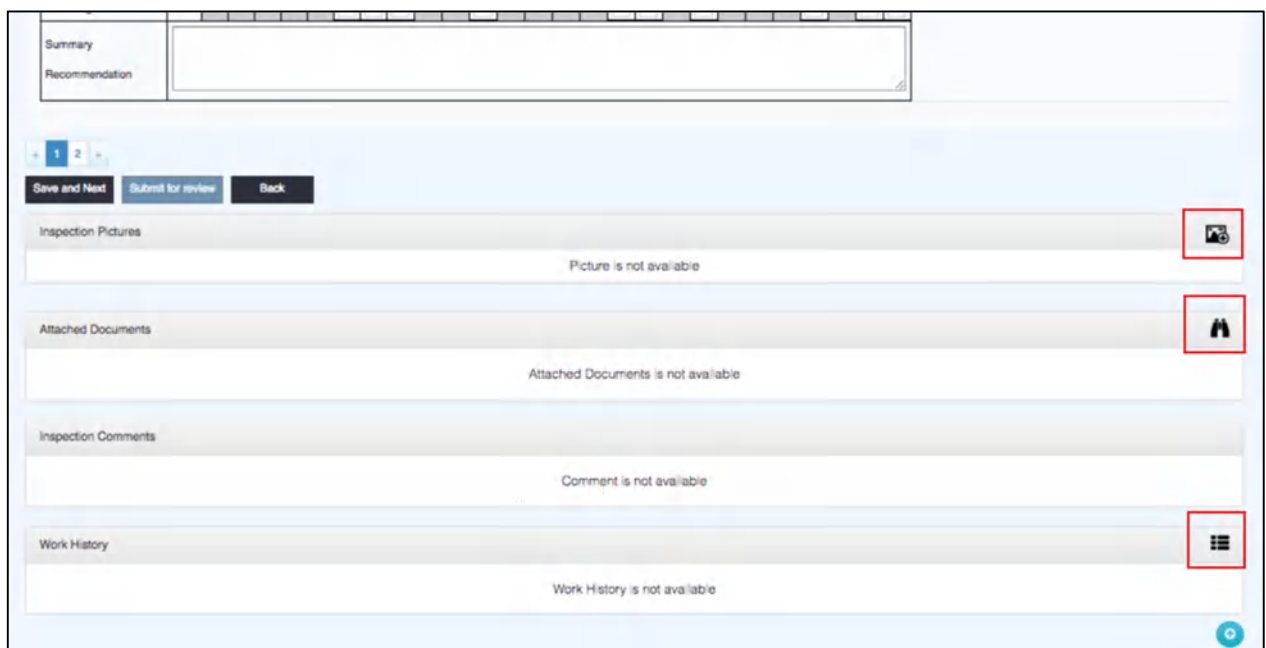
The screenshot shows a software interface with a 'Fill with "a"' button. Below it is a table with the following data:

File Number	INS-N105--20180726		
Zone	Barishal	Circle	Pat
Inspection Date	2018-07-28		
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.



The screenshot shows a form with several sections. At the top, there are buttons for 'Save and Next', 'Submit for review', and 'Back'. Below these are sections for 'Inspection Pictures', 'Attached Documents', 'Inspection Comments', and 'Work History'. Each section has a placeholder text 'is not available'. On the right side of the form, there are three red boxes highlighting icons: a camera icon for 'Inspection Pictures', a document icon for 'Attached Documents', and a list icon for 'Work History'.

(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.	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”.

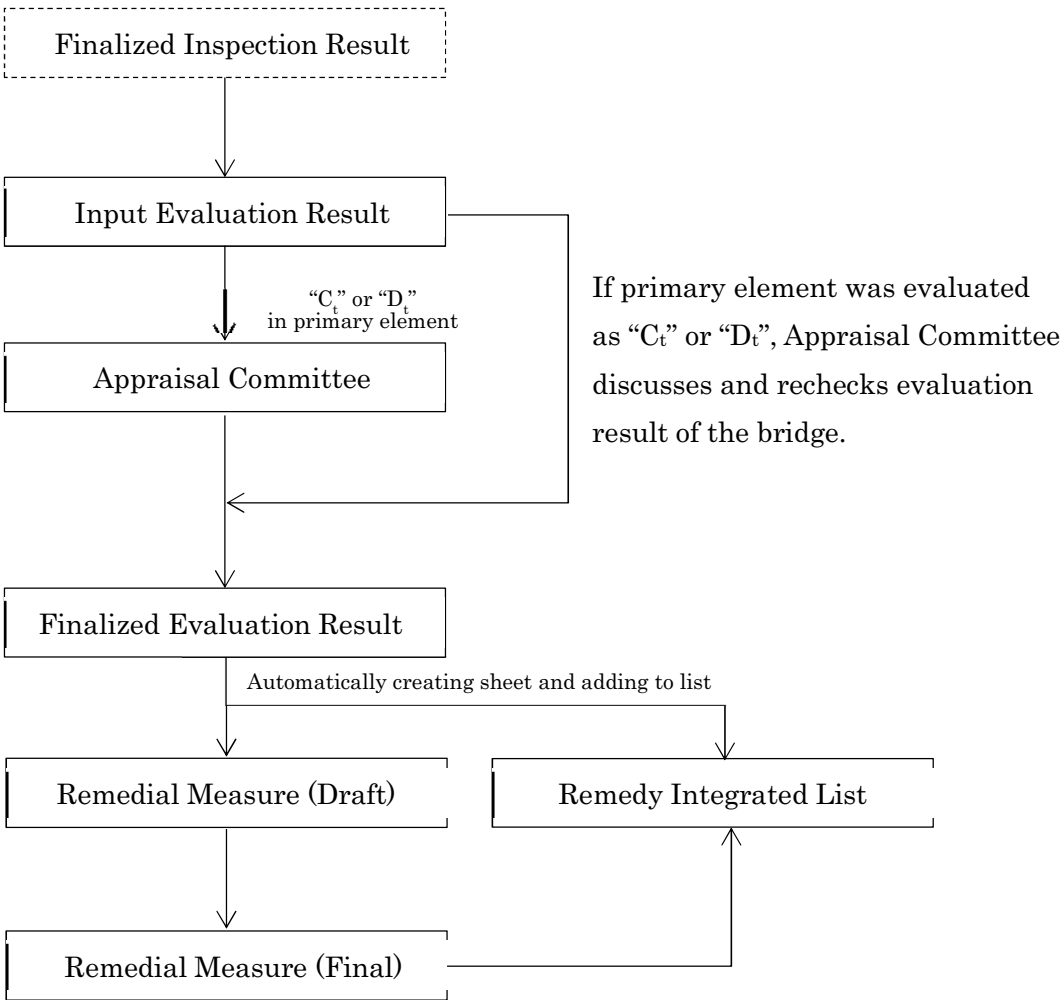


Figure. Flowchart of inputting Evaluation Result into BMS

6.6.1. Preparation to input Evaluation Result

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

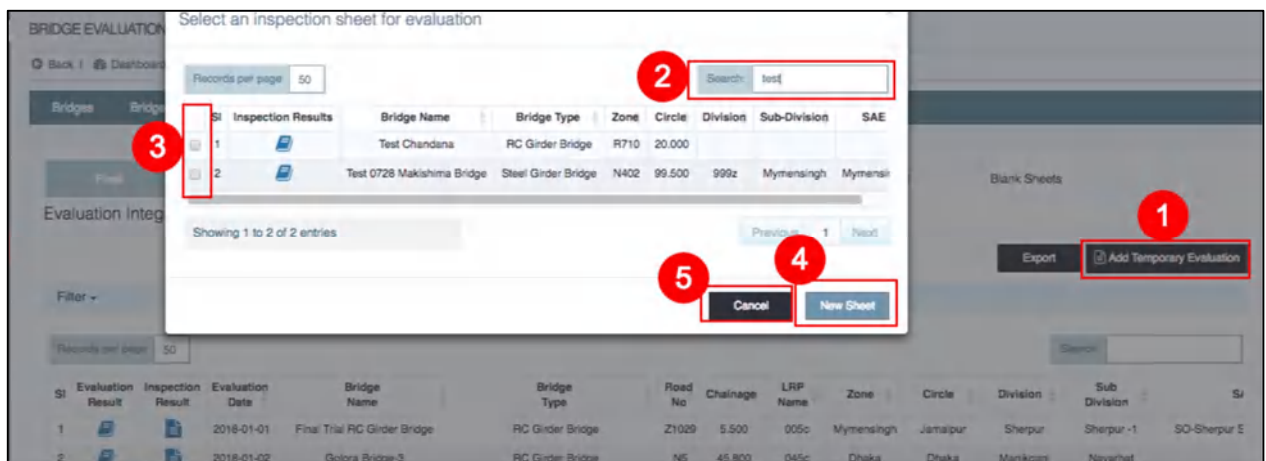
It is better to print out following items.

- 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

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:
 - “Recycle Bin Icon”: Click this icon to delete evaluation sheet.
 - “Book Icon”: Click this icon to view evaluation results.
 - “File Icon”: Click this icon to see bridge inventory data.



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

- (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 (BIMS)

100% evaluation has been completed

100%

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.

Choose a category.

File Number:	EVA-R23- LRP023-20170303	Bridge Name:	test_feb_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	Bt	Ct	Dt	Public Safety	Detailed investigation	Remarks
		Steel	1. Corrosion	☒	☐	☐	☐	☐	☐	
		Steel	2. Crack	☒	☐	☐	☐	☐	☐	
		Steel	3. Loose or Missing Bolts	☒	☐	☐	☐	☐	☐	
		Steel	4. Fracture	☐	☒	☐	☐	☐	☐	
		Steel	5. Deterioration of Paint System	☐	☒	☐	☐	☐	☐	
		Concrete	6. Cracking	☐	☐	☐	☐	☐	☐	
		Concrete	7. Spalling /Exposed Rebar	☐	☐	☐	☐	☐	☐	
		Concrete	8. Water leakage/ Efflorescence	☐	☐	☐	☐	☐	☐	
		Concrete	9. Fallen out of Deck Slab	☐	☐	☐	☐	☐	☐	
		Concrete	10. Crack of Deck Slab	☐	☐	☐	☐	☐	☐	
		Concrete	11. Delamination	☐	☐	☐	☐	☐	☐	
		Concrete	12. Abnormal Spacing	☐	☐	☐	☐	☐	☐	
		Concrete	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”.

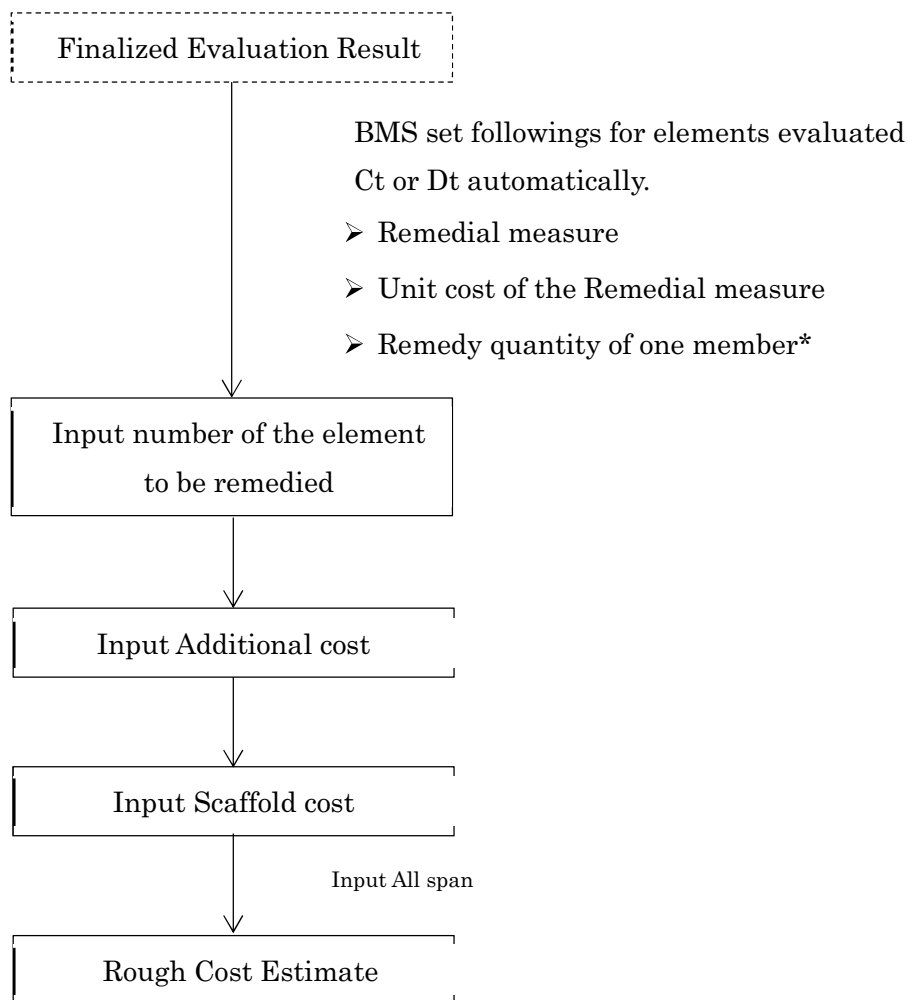
(d) Check and discuss with the EVALUATION APPROVAL SHEET.

(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. The left sidebar contains navigation links: Dashboard, Bridge List, Bridge Inspection, Bridge Evaluation, Bridge Remedial Measure, Bridge Remedial List, Settings, Tools, and Activity Log. The main content area has tabs: Bridges, Bridge Inspections, Bridge Evaluations, Bridge Remedial Measure (active), Bridge Remedies, and Bridge Data Settings. Below the tabs, there are buttons for 'Final' (2) and 'Draft' (1). A 'Remedial Measure List' section includes a 'Filter' button (3), a 'Records per page' dropdown (4) set to 10, and an 'Export' button (5). A search bar (6) is also present. The table below lists remedial measures with columns: Sl, Final Count, Result Sheet, Report Form, Evaluation Date, Bridge Name, Bridge Type, Road No, Chainage, LRP Name, Zone, Circle, Division, and Sub Division. The first row is highlighted with a red box (7).

Sl	Final Count	Result Sheet	Report Form	Evaluation Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle	Division	Sub Division
1	1			2018-07-26	Additional DIT Bridge	RC Girder Bridge	Z1029	5.500	005c	Mymensingh	Jamalgur	Sherpur	Sherpur -1 SO-I
2				2018-07-25	Test_101	Steel Girder Bridge with Concrete Deck	N105	0.000		Barishal	Patakhali	Barguna	Barguna
3				2018-05-07	Demo matamuhuri	RC Girder Bridge	N5	70.250	70a	Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
4				2018-04-16	Amrila Bailey Bridge	Potable Steel Bridge	R315	0.000	044a	Dhaka	Dhaka	Manikganj	Nayrhat
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	N5	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
9	1			2018-03-08	Demo matamuhuri	RC Girder Bridge	N5	70.250	70a	Dhaka	Dhaka	Dhaka	Dhaka-1 SO-I
10	1			2018-03-08	demo_dtc_0	RC Girder Bridge	N5	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:
 - “**Final Count**” shows number of times to finalized remedial measure of the bridge.
 - “**Book Icon**”: Click this icon to view remedial measure results.
 - “**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 >

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

13. User has to input manually “**Scaffold Cost**” for targeted span.
14. “**TOTAL**” shows total cost of targeted span.
15. By clicking “**Save and Next**”, you can save result of targeted span and go to next span.
(Only for multiple span bridge)
16. 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.

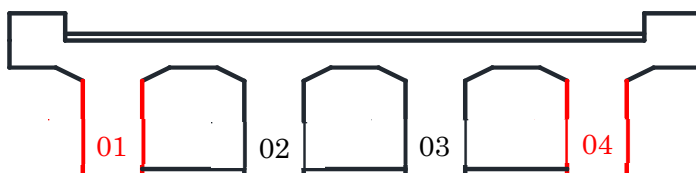
e.g. Serious corrosion of Steel Main Girder

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.**



Red main girder is damaged.

Inspection Result		Crack	
Main Girder	01	c	← Necessary
Main Girder	02	a	← No need
Main Girder	03	b	← No need
Main Girder	04	d	← Necessary

- 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.

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

Span length , Bridge Width : Refer Bridge Inventory.

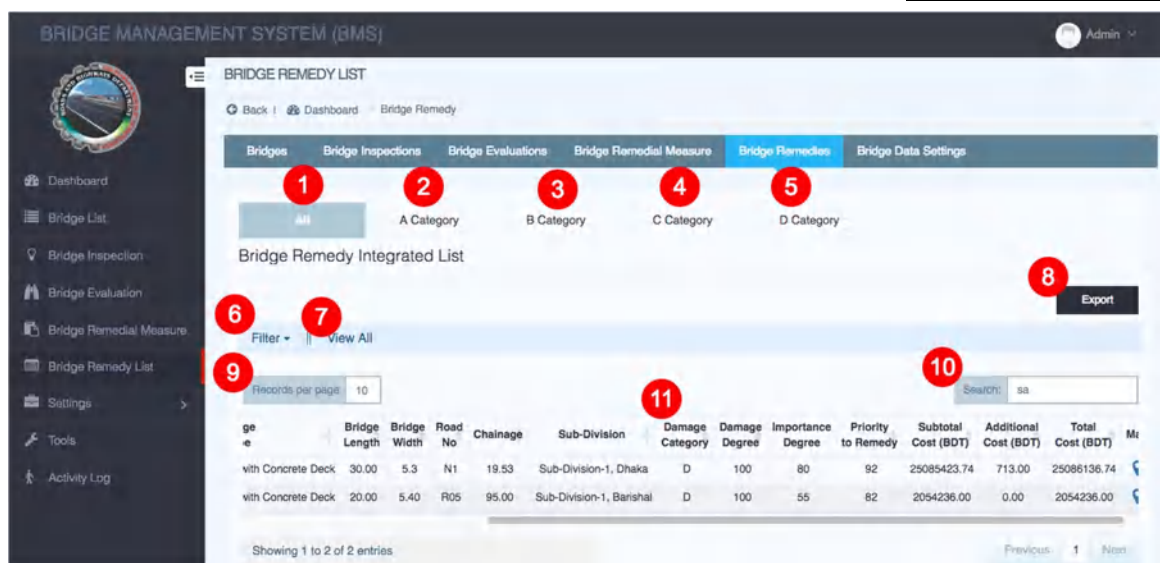
ratio of setting are : User (mainly Evaluator) considers required area of scaffold to carry out remedy construction like as “all span length”, “1/2 of span length” or “1/4 span length”.



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

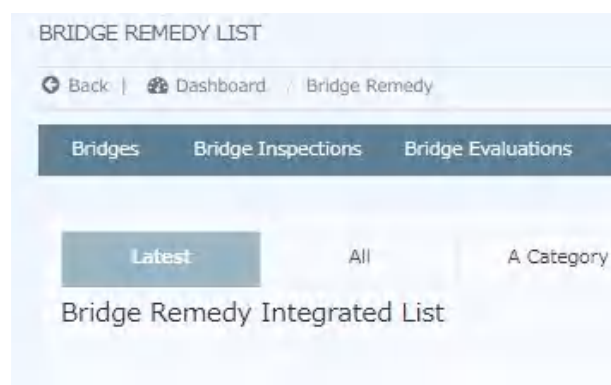


1. Click “All” to view all category bridges.
2. Click “A Category” to view all A category bridges.
3. Click “B Category” to view all B category bridges.
4. Click “C Category” to view all C category bridges.
5. Click “D Category” to view all D category bridges.
6. Click “Filter” to filter remedy list.
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.



Information		BMS Result of Manikganj Area (1st Periodic Inspection)										1. Input Information and date.		10. Input Budget Amount.		Budget (BDT)
Date		2018 Jan 16														6,000,000
No.	Bridge Name	Bridge Type	Bridge Length	Bridge Width	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	Nayarith		D	97	95		3,001,951	0	2,112	2,112
2	Golara Bridge-3	RC Girder Bridge	48.7	8.0	N5	45.800	Nayarith		B	56	70	61	5,026	0	3,001,951	3,004,063
3	Kolia Bailey Bridge	Bailey Bridge with Steel Deck	52.0	3.9	Z5064	11.412	Manikganj						0	0	126,026	3,130,089
4	Kholapara Bridge	RC Girder Bridge	25.4	10.3	R504	18.200	Manikganj						0	0	0	3,130,089
5	Wishibari Bridge	RC Girder Bridge	13.2	7.9	N5	42.925	Nayarith						3,323	0	0	3,130,089
6	Kaliya-1 Bridge	RC Girder Bridge	150.6	7.0	N5	29.010	Nayarith						0	0	1,453,323	4,583,412
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	Kashimagar Culvert								B	52	70	59	65,236	0	197,184	4,780,596
11	Bathoinuri Bailey Bridge-1								B	55	65	59	0	0	65,236	4,845,832
12	Bathuli Bridge-1	RC Girder Bridge	13.4	8.0	N5	38.800	Nayarith		B	33	95	58	14,180	0	0	4,845,832
13	Sorupai Bailey Bridge	Bailey Bridge with Steel Deck	36.7	3.4	Z5064	7.812	Manikganj		C	64	45	56	0	0	14,180	4,860,012
14	Kunduriya Bridge								B	49	65	55	13,437	0	0	4,860,012
15	Kalampur Bridge-2								B	23	100	54	1,570,460	225,000	238,437	5,098,449
16	Kalampur Box Culvert								A	19	100	52	782,889	150,000	1,720,449	6,818,909
17	Dautiya Bridge-2								A	18	100	51	0	0	0	7,601,798
18	Sharifbag Bailey Bridge								B	38	70	51	0	0	0	7,601,798
19	Sutipara Bridge								A	17	100	43	0	0	0	8,351,798
20	Chakrabarti Bridge-2								A	11	100	43	0	0	0	8,351,798
21	Kaliya Bridge-2								A	14	100	42	0	0	0	8,924,946
22	Baropara Box Culvert 3								A	8	100	40	0	0	0	8,924,946
23	Choto Tori								A	7	100	44	0	0	0	8,924,946
24	Chandra Box	Box Culvert	22.0	22.0	N740	12.000	Nayarith		A	5	100	43	0	0	0	8,924,946
25	Steenampur Bridge-1	RC Girder Bridge	48.7	8.5	N5	35.920	Nayarith		A	5	100	43	0	800,000	500,000	9,424,946
26									A	0	105	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	19,372	9,444,318
29									A	0	100	40	578,217	0	628,217	10,072,535
30									A	0	100	40	0	0	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

10. Input Budget Amount.

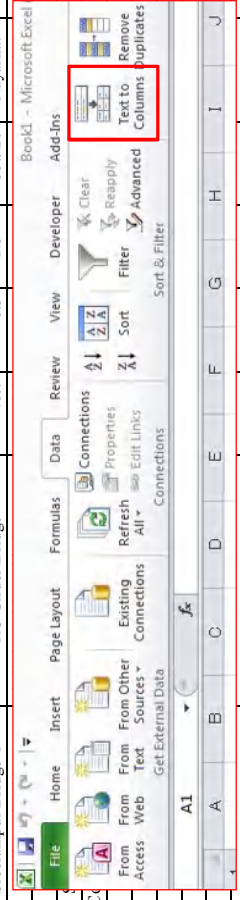
1. Input Information and date.

You can arrange descending order or ascending order with this switch of each column.

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

Operation 5. to 9. has done for column "P".

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



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".

BMS Result of Manikganj Area (1st Periodic Inspection)													
Information		Date											
2018 Jan 16													
Bridge Name	Bridge Type	Road No	Chain -age	Sub -Division	Damage Category	Remove or not	Bridge Length	New Bridge Bridge Type	Cost of Rebuild of Bridge (BDT)			Comparing Cost Every Year	
									Remove	Rebuild	Total	Remedy cost (20 years)	Rebuild cost (50 years)
Gazikhali Bridge	RC Girder Bridge	N5	42.300	Nayabhat	D	Remove	113.3	Concrete	67,980,000	67,980,000	135,960,000	106	2,719,200
Golara Bridge-3	RC Girder Bridge	N5	45.800	Nayabhat	C	Remove	48.7	Concrete	29,220,000	29,220,000	58,440,000	150,098	1,168,800
Kolta Bailey Bridge	Bailey Bridge with Steel Deck	Z5064	11.412	Manikganj	D	Remove	52.0	Concrete	31,200,000	31,200,000	62,400,000	6,302	1,248,000
Kholapara Bridge	RC Girder Bridge	R504	18.200	Manikganj	D	Remove	25.4	Concrete	15,330,000	15,330,000	30,660,000	0	609,600
Wishibari Bridge	RC Girder Bridge	N5	42.925	Nayabhat	B	Remove	13.2	Concrete	7,890,000	7,890,000	15,780,000	0	317,520
Kelya-1 Bridge	RC Girder Bridge	N5	29.010	Nayabhat	B	Remove	150.6	Concrete	78,900,000	78,900,000	157,800,000	72,667	3,614,400
N54014680	Box Culvert	N540	14.680	Nayabhat	B	Remove	9.6	Concrete	4,680,000	4,680,000	9,360,000	0	230,400
Bynile Bridge	RC Girder Bridge	R504	18.836	Manikganj	B	Remove	25.6	Concrete	15,330,000	15,330,000	30,660,000	0	613,200
Bathuli Bridge-3	RC Slab Bridge	N5	39.200	Nayabhat	B	Remove	7.8	Concrete	4,680,000	4,680,000	9,360,000	0	187,200
Kashinnagar Culvert	Box Culvert	R504	16.860	Manikganj	B	Remove	13.5	Concrete	8,100,000	8,100,000	16,200,000	9,860	324,000
Bathoimuri Bailey Bridge-1	Box Culvert				B	Remove	30.5	Concrete	18,288,000	18,288,000	36,576,000	3,262	731,520
Bathuli Bridge-1					C	Remove	13.4	Concrete	8,040,000	8,040,000	16,080,000	0	321,600
Sorupai Bailey Bridge					B	Remove	36.7	Concrete	22,020,000	22,020,000	44,040,000	709	880,800
Kundunya Bridge					B	Remove	33.0	Concrete	19,800,000	19,800,000	39,600,000	0	792,000
Kalampur Bridge-2					B	Remove	13.2	Concrete	7,890,000	7,890,000	15,780,000	11,922	315,600
Kalampur Box Culvert					A	Remove	91.4	Concrete	54,810,000	54,810,000	109,620,000	54,810	2,192,400
Dautiya Bridge-2	RC Girder Bridge	N5	32.850	Nayabhat	A	Remove	13.0	Concrete	7,800,000	7,800,000	15,600,000	39,145	312,000
Shanibag Bailey Bridge	Bailey Bridge with Steel Deck	R315	49.800	Nayabhat	B	Remove	115.0	Concrete	69,000,000	69,000,000	138,000,000	0	2,760,000
Sutipara Bridge	RC Girder Bridge	N5	35.180	Nayabhat	A	Remove					37,500	37,500	1,178,400
Chakrabarti Bridge-2	PC Girder Bridge	N540	0.000	Nayabhat	A	Remove					0	0	828,000
Kelya Bridge-2	RC Girder Bridge	N5	29.520	Nayabhat	A	Remove					28,658	28,658	292,560
Banoipara Box Culvert 3	Box Culvert	N540	13.900	Nayabhat	A	Remove					0	0	48,000
Choto Tori	RC Girder Bridge	N5	56.788	Manikganj	A	Remove					0	0	456,000
Chandra Box	Box Culvert	N540	15.600	Nayabhat	A	Remove					0	0	120,000
Sreemampur Bridge-1	RC Girder Bridge	N5	35.920	Nayabhat	A	Remove					25,000	25,000	1,168,800
Jubingol Bridge	Steel Girder Bridge with Concrete Deck	N5	24.550	Nayabhat	A	Remove					0	0	292,560
Kusthia Bridge	RC Girder Bridge	N5	0.000	Manikganj	A	Remove					0	0	456,000
Sreemampur Bridge-2	RC Girder Bridge	N5	0.000	Manikganj	A	Remove					969	969	456,000
Coerdanga Box Culvert	Box Culvert	N5	76.922	Manikganj	A	Remove					0	0	88,800
Kalampur Bridge-1	RC Girder Bridge	N5	34.080	Nayabhat	A	Remove					31,411	31,411	313,200
Bongshi Bridge	PC Girder Bridge	N5	25.230	Nayabhat	A	Remove					0	0	4,728,480
Noyadangi Bridge	RC Girder Bridge	N5	43.700	Nayabhat	A	Remove					0	0	624,000
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0									

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.

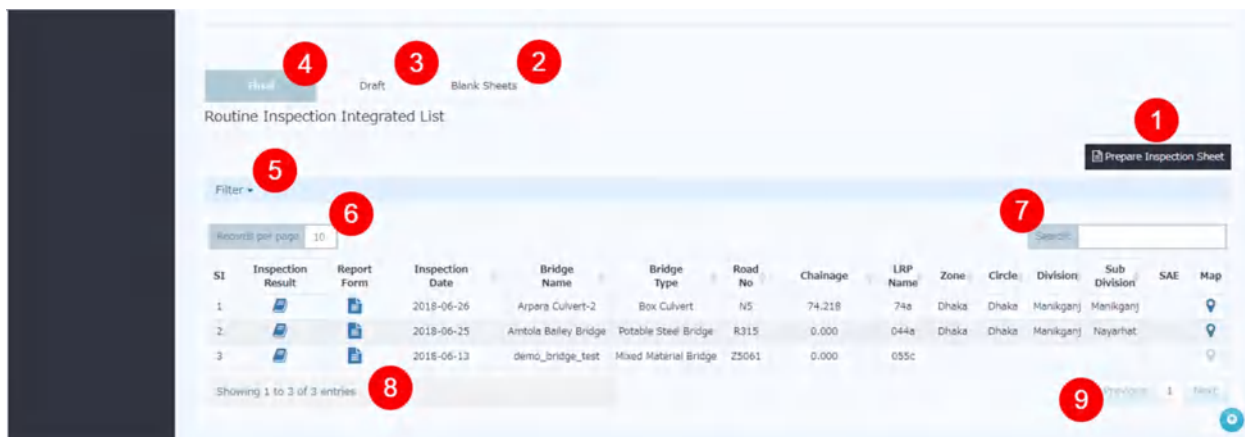
Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr/Inspector Evaluator	Chief Insp.	Public

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

7.2.2. Outline of “Bridge Inspection” page

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

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



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

- (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.

- (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	HIS-Z1029-005C-20180728			Inspector	Admin	Date	2018-07-28	
Zone	Hymenangh	Circle	Jamgaipur	Division	Sherpur	Sub-Division	Sherpur -1	
Road No.	Z1029	Road Name	unknown			GPS	Lat	89° 59' 59"
						Long	12° 59' 59"	
Bridge Name	Addiboni 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	—	—	—	—				
• Abnormal bituminous pavement	—	—	—	—				
• Accumulation of debris	—	—	—	—				
2 Expansion Joints								
• Material defects*	—	—	—	—				
• Abnormal spacing	—	—	—	—				
3 Accumulation of water*								
• Abnormal anchorage	—	—	—	—				
• Abnormal deflection	—	—	—	—				
• Deformation /break	—	—	—	—				
4 Drainage system								
• Material Defects*	—	—	—	—				
• Water leakage	—	—	—	—				
• Deformation /break	—	—	—	—				
• Accumulation of debris	—	—	—	—				
Material *	Defects description							
Concrete	Crack, spalling/exposed rebar, water leakage/efflorescence, delamination							
Steel	Corrosion, crack in steel, loose or missing bolt, fracture, deterioration of paint system							
General Comments								

- (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

$$\begin{aligned} & \text{Damage Degree (max: 100pt)} \\ = & \text{Damage degree of Superstructure (max: 100pt)} \times \text{Impact of Superstructure (= 0.5)} \\ & + \text{Damage degree of Substructure (max: 100pt)} \times \text{Impact of Superstructure (= 0.3)} \\ & + \text{Damage degree of Bearings (max: 20pt)} \times \text{Impact of Superstructure (= 0.2)} \end{aligned}$$

2) Bridge Type without Bearings

$$\begin{aligned} & \text{Damage Degree (max: 100pt)} \\ = & \text{Damage degree of Superstructure (max: 100pt)} \times \text{Impact of Superstructure (= 0.6)} \\ & + \text{Damage degree of Substructure (max: 100pt)} \times \text{Impact of Superstructure (= 0.4)} \end{aligned}$$

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).

$$\begin{array}{l}
 \text{Damage degree of Superstructure} \\
 \text{Damage degree of Substructure} \\
 \text{Damage degree of Bearings} \\
 = \text{Impact level} \times \text{Evaluated degree (At=0, Bt=33, Ct=67, Dt=100)} \\
 \times \text{Weight coefficient of the element} \times \text{Weight coefficient of the defect}
 \end{array}$$

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”)

$$\begin{array}{l}
 \text{Damage Degree of superstructure in first span} = \\
 \text{Impact level of Component superstructure } X_{dd} = 0.50 \times \left\{ \begin{array}{l} 0.5 \times \\ 1.00 \times 0.50 \times 33 + \\ 0.80 \times 0.75 \times 67 \end{array} \right\} \\
 = 0.5 \times (16.5 + 40.2) = 28 \text{ pt} \\
 \left\{ \begin{array}{l} \text{Coefficient of Element Main Girder } x1.00 \\ \text{Coefficient of Type of defect Corrosion } x0.50 \\ \text{Evaluated degree Bt } 33 \text{ pt} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Coefficient of Element RC Slab } x0.80 \\ \text{Coefficient of Type of defect Crack of Slab } x0.75 \\ \text{Evaluated degree Ct } 67 \text{ pt} \end{array} \right\} +
 \end{array}$$

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	0.50	Main girder	1.00	1	Corrosion	0.60	C → 67	21	25	Sp1>S 25>10	25+3+12 =40
					Missing bolt	0.20	B → 33	4				
				2	Corrosion	0.60	B → 33	10	10			
			Cross beam	0.25	1	Corrosion	0.60	B → 33	3	3	3	
					2	none	0.00	A → 0	0	0		
			Deck slab	0.80	1	Cracks	0.75	B → 33	10	10+2= 12	12	
						Efflorescence	0.13	B → 33	2			
					2	Cracks	0.75	B → 33	10	10		
Sub-structure	30	0.30	Abutment	0.67	1	Cracks	0.43	B → 33	3	3	8	8+8+21 =37
					2	Cracks	0.43	C → 67	6	8		
				Efflorescence	0.29	B → 33	2					
			Pier	0.67	1	Cracks	0.43	C → 67	6	8	8	
						Efflorescence	0.29	B → 33	2			
			Foundation	1.00	1	Scouring	1.00	C → 67	21	21	21	
2	none	0.00			A → 0	0	0					
Bearings	20	0.20	Bearing	1.00	1	none	0.00	A → 0	0	0	5	5
					2	Function Disorder	0.75	B → 33	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 $46\text{pt} + 21\text{pt} + 20\text{pt} = 87\text{pt}$

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
		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
	Cross Beam	0.25	Cracking	0.40	Bt	33	3.30
		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
	Deck Slab	0.80	Fallen out	1.00	Bt	33	26.40
		0.80	Crack of DS	0.25	Bt	33	6.60
		0.80	Delamination	0.03	Bt	33	0.79
Sub Damage point of Superstructure						91.01	(D)
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	
		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	
	Foundation	1.00	Cracking	0.40	Bt	33	13.20	
		1.00	Spalling	0.30	Bt	33	9.90	
	Sub Damage point of Substructure							70.70
Total Damage point of Substructure					Y _{dd} =	0.30	21	Y _{dd} x (D)
Maximam point = Y _{dd} x 100 = 30 > 21							ok	

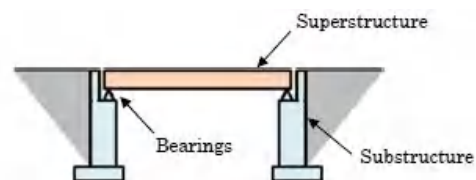
BEARING	Weight Coefficient of Element (A)		Weight Coefficient of Defects (B)		Converted Evaluated Score (C)		Damage Point (A)x(B)x(C)
	Bearing	1.00	Corrosion	0.25	Bt	33	8.25
		1.00	Crack	1.00	Bt	33	33.00
		1.00	Missing bolt	0.50	Bt	33	16.50
		1.00	Fracture	1.00	Bt	33	33.00
		1.00	Paint system	0.25	Bt	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
	Seat	0.25	Break	0.29	Bt	33	2.39
Sub Damage point of Bearing						177.55	(D)
Total 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)

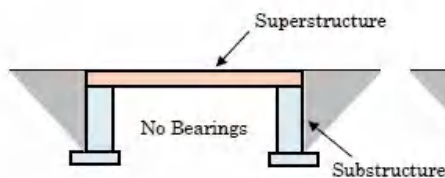
Component	Impact level *)	Details
Superstructure	0.5	This damage directly impacts bridge function.
Substructure	0.3	Compared to superstructure, the impact of this damage to bridge function is not great as the size of the structure is large.
Bearings	0.2	The impact of this damage to bridge function is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



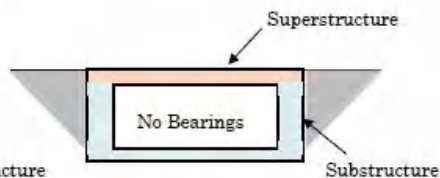
RC/PC Girder Bridge, Steel Girder Bridge

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
Substructure	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. Discoloration / 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. Discoloration / 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. Discoloration / 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. Abnormal 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. Discoloration / 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. Settlement / 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. Deterioration 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. Settlement / 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. Settlement / 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**

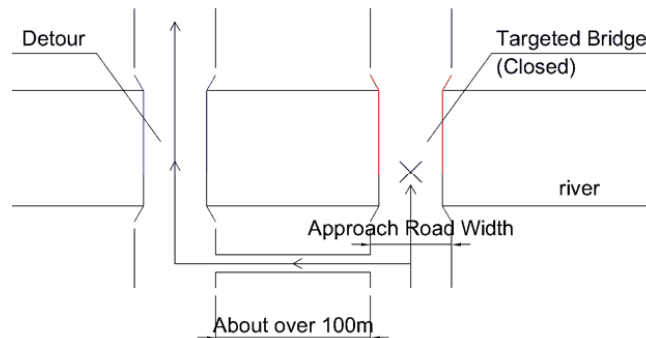
e.g.

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

[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

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

$$30\text{pt} + 25\text{pt} + 15\text{pt} + 30\text{pt} = 100\text{pt}$$

9.3 How to calculate Priority to Remedy

Priority Remedy is calculated by following formula.

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

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,.

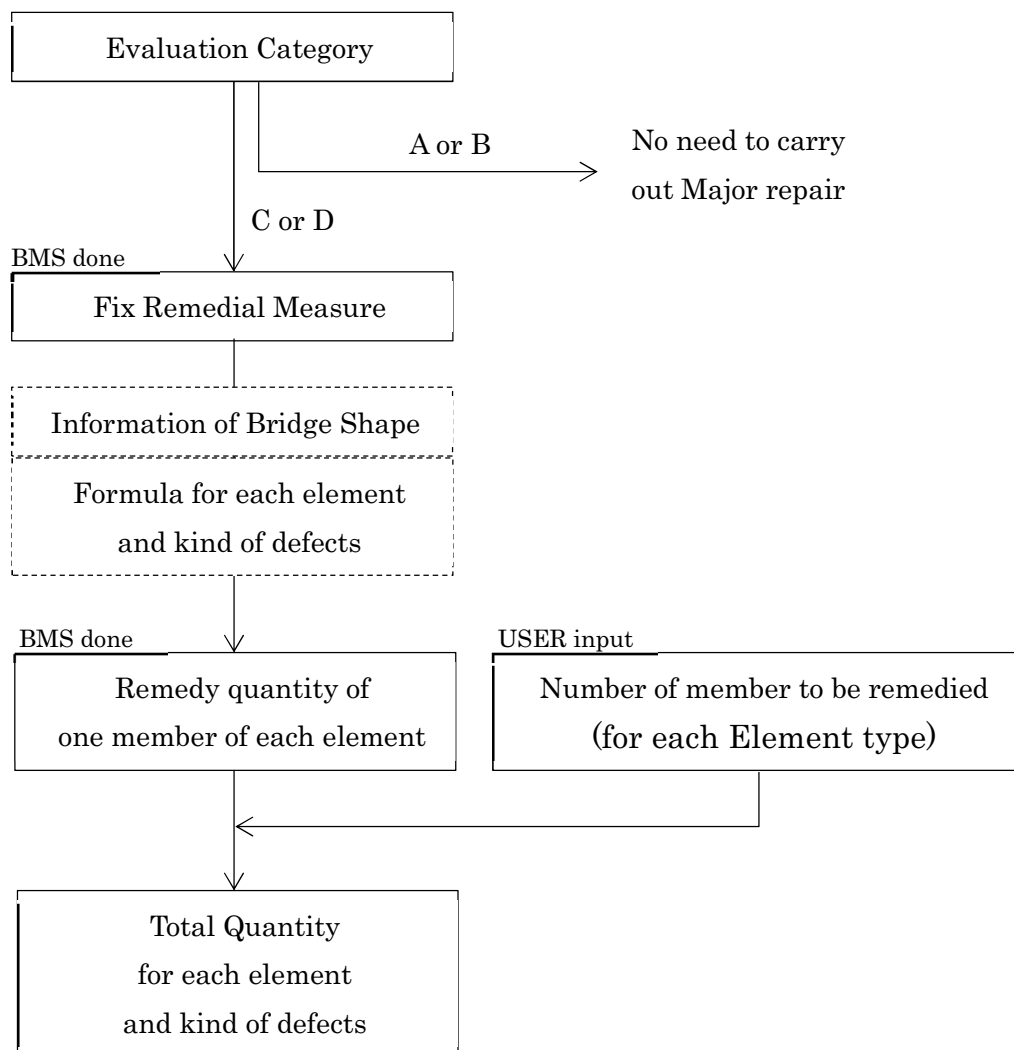
9.5 How to Calculate Quantity to Remedied

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.

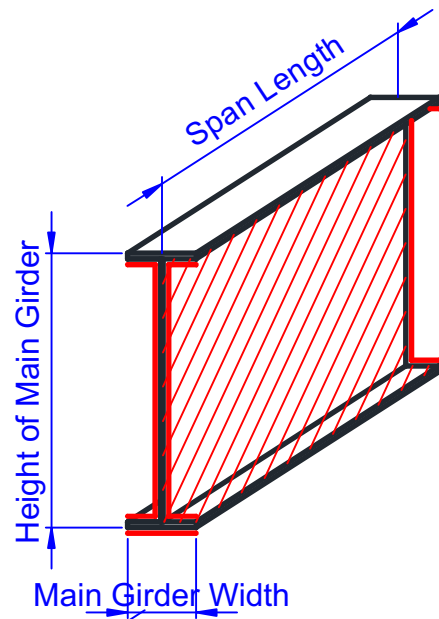
Note

“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

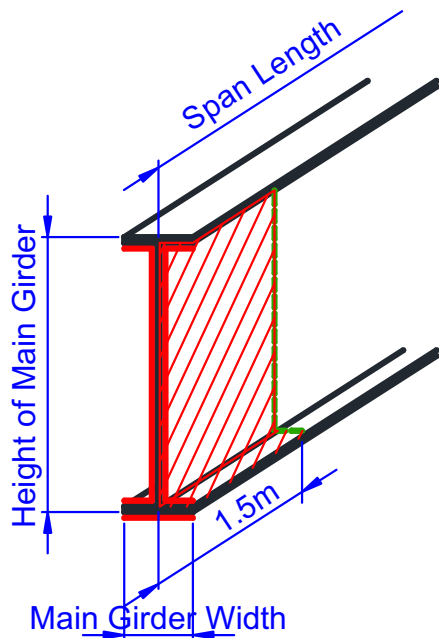
1.0 x ← coefficient
(MG Width x3 + Height of MG x2) x Span Length
: Basic Formula 207



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

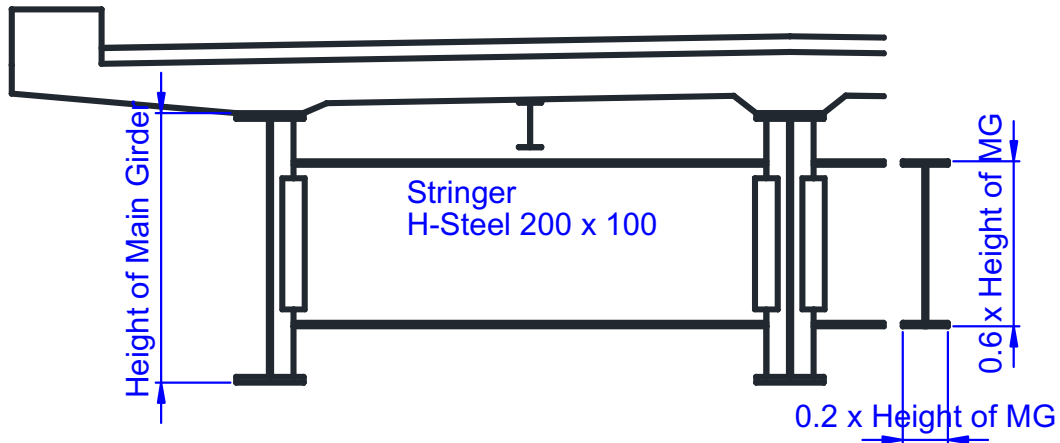
3.0 x ← coefficient
(MG Width x2 + Height of MG x2)
: Basic Formula 209



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"

$$(\text{Width} + \text{Height}/2 \times 2) \times \text{Span}/0.5\text{m}$$

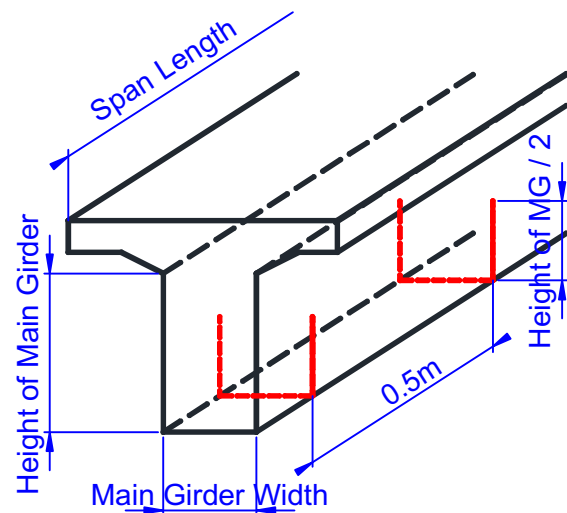
→

2.0 x

← coefficient

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

: Basic Formula 205



e.g.5 CFS Bonding of Concrete Girder

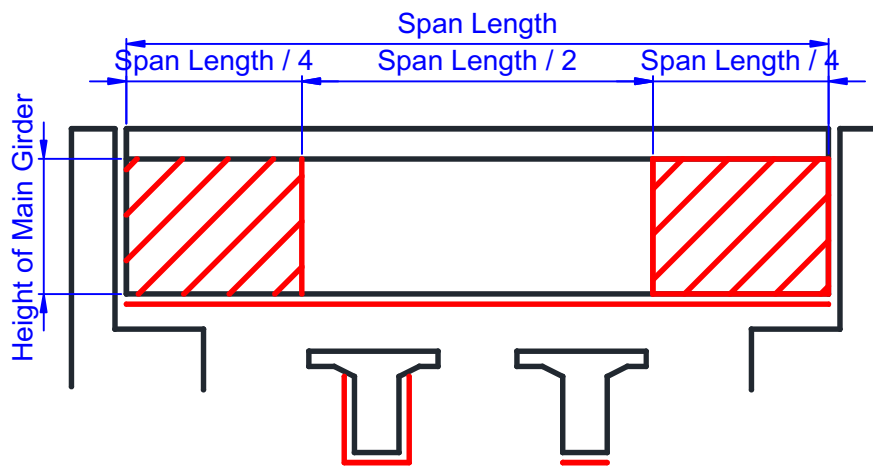
- Damage of Crack Dt
- Area (m2)
- Reinforcing with Carbon Fiber Sheet.

Width x Span + (Height x 2 x Span/4) x 2 → 1.0 x

← coefficient

(MG Width x1 + Height of MG x1) 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 x ← coefficient

MG Width x Span Length

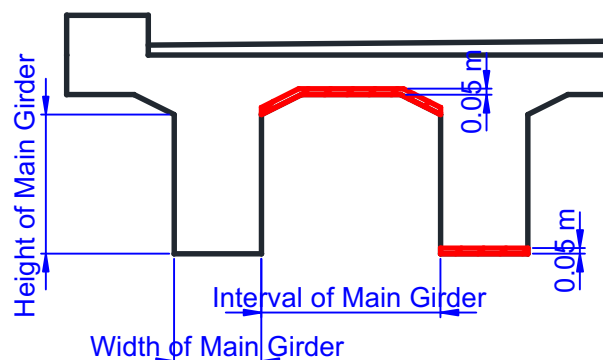
: Basic Formula 204

For Concrete Deck Slab

0.05 x ← coefficient

Interval of MG x Span Length

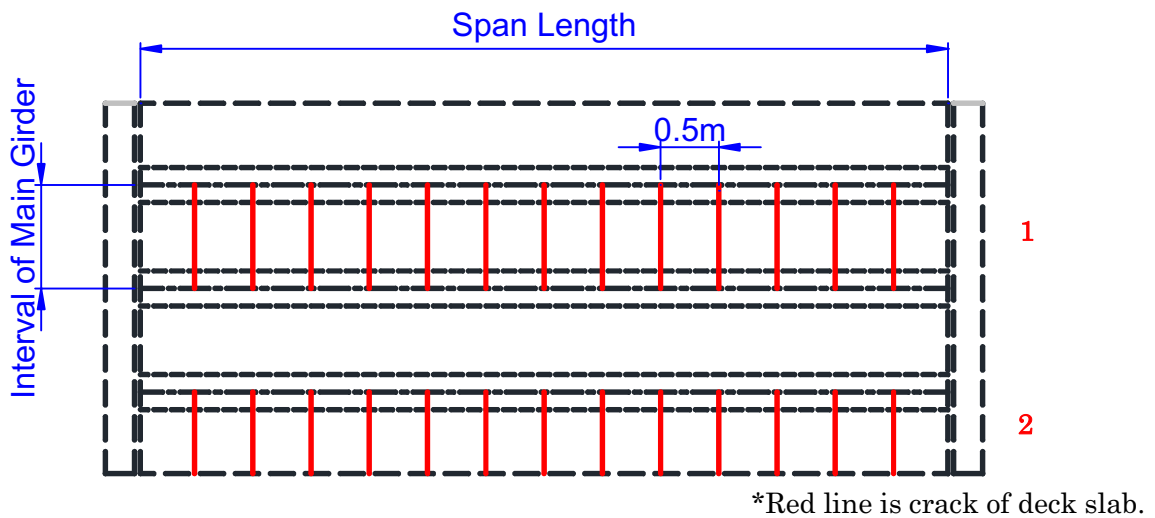
: Basic Formula 202



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)

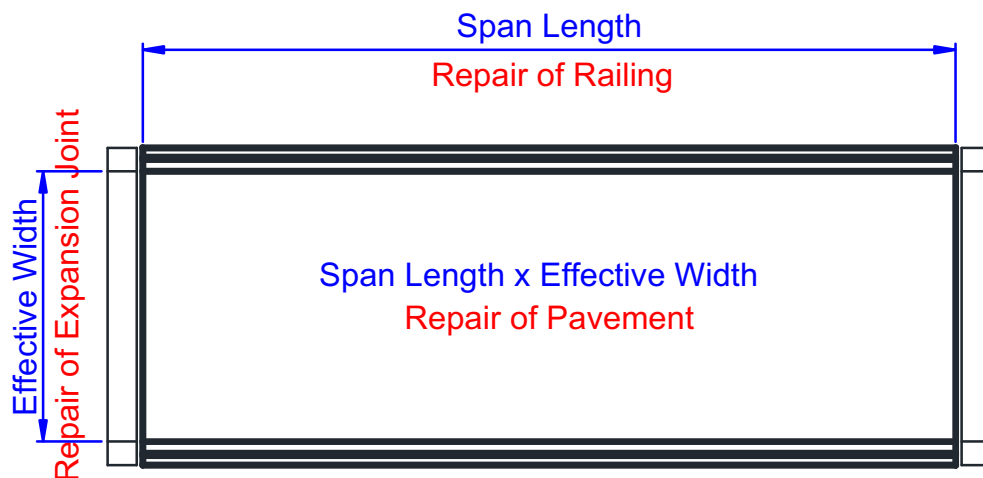
Interval of MG x Span length / 0.5m → 1.0 x ← coefficient
Interval of MG x Span Length
: Basic Formula 202



e.g. In case of above drawing,

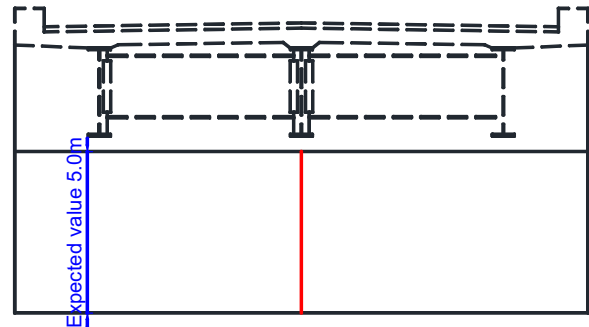
Number of element (to be remedied) in Bridge Remedial Measure is “2”.

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 x ← coefficient

Fix (Fix is same as 1.0) Basic Formula 101

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

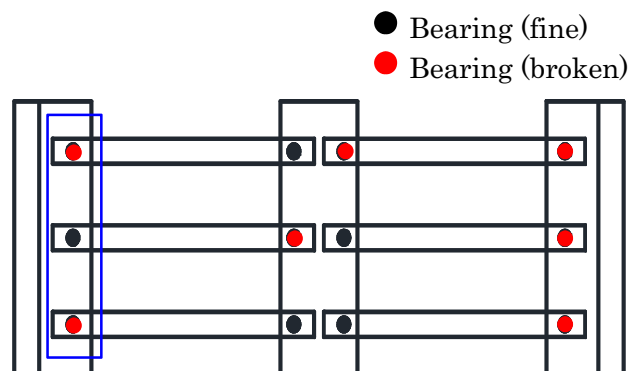
- Settlement/Tilt/Movement and Scouring of Footing Ct or Dt
- Repairing of Settlement, Repairing of Scouring
- Volume of buried work (m3)
- Volume of each footing is fixed as Width 10.0m x Length 5.0m x Depth 3.0m = 150 m3

150 x ← 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]

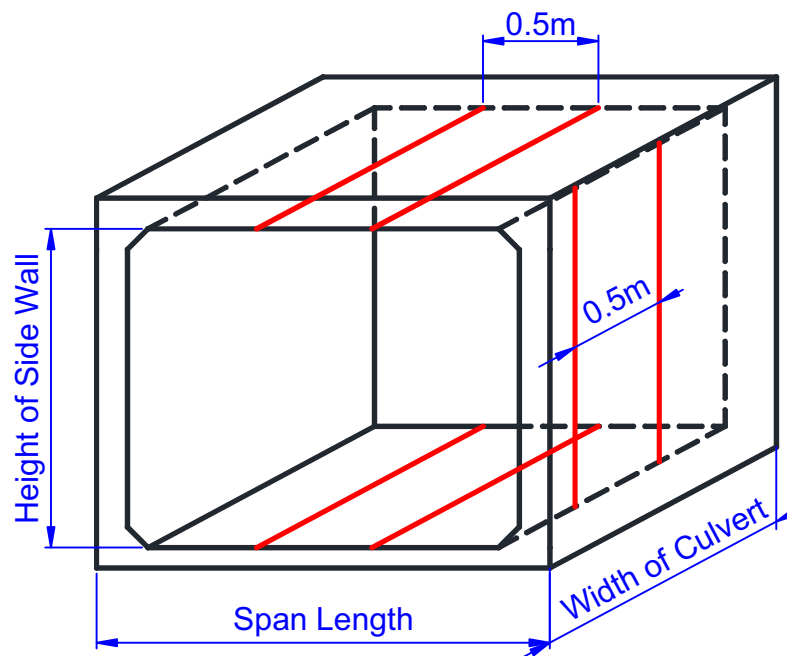
2.0 x ← coefficient

Width of Culvert x Height of Side Wall Basic Formula 303

[Crack of Footing]

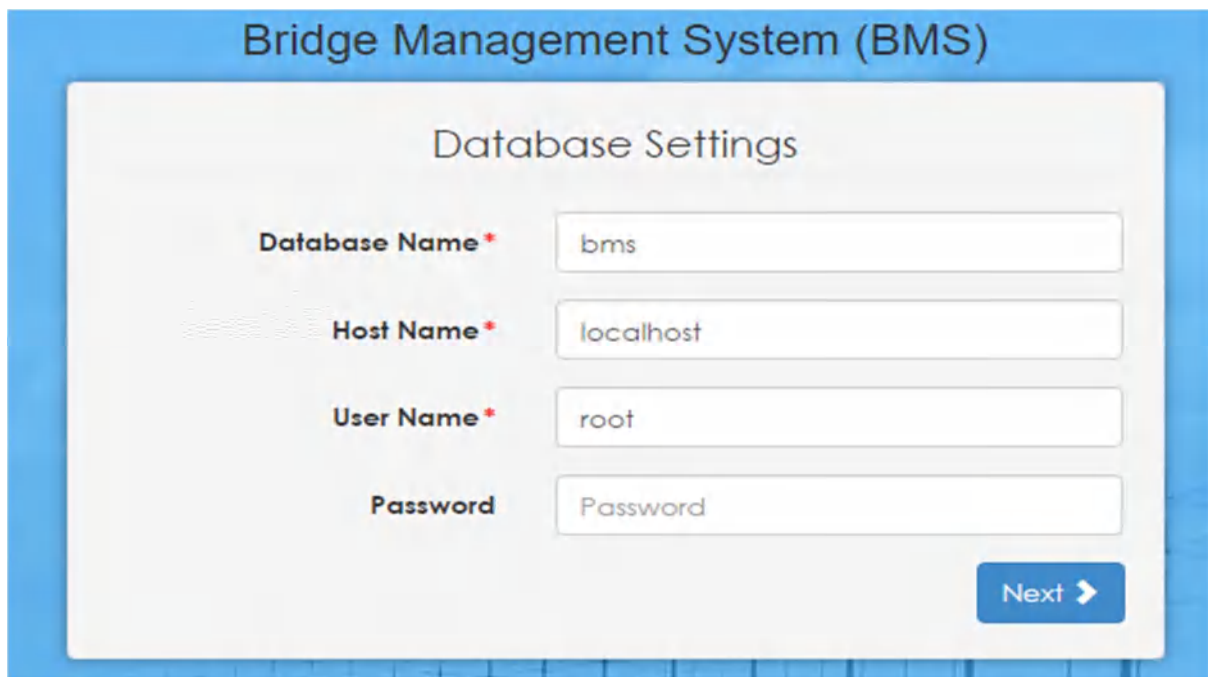
2.0 x ← coefficient

Span Length x Width of Culvert Basic Formula 301



10. HOW TO INSTALL BMS

1. Copy the bms.zip folder to the root of the hosting directory.
2. Unzip the zip file.
3. Create a MySQL database and user if required.
4. Open a browser and type the hosting domain name.
5. Database setting screen will show up.



The screenshot shows the 'Bridge Management System (BMS)' interface with a 'Database Settings' form. The form has four input fields: 'Database Name' with the value 'bms', 'Host Name' with the value 'localhost', 'User Name' with the value 'root', and 'Password' with the value 'Password'. A 'Next' button with a right arrow is located at the bottom right of the form.

Database Settings	
Database Name *	bms
Host Name *	localhost
User Name *	root
Password	Password
Next >	

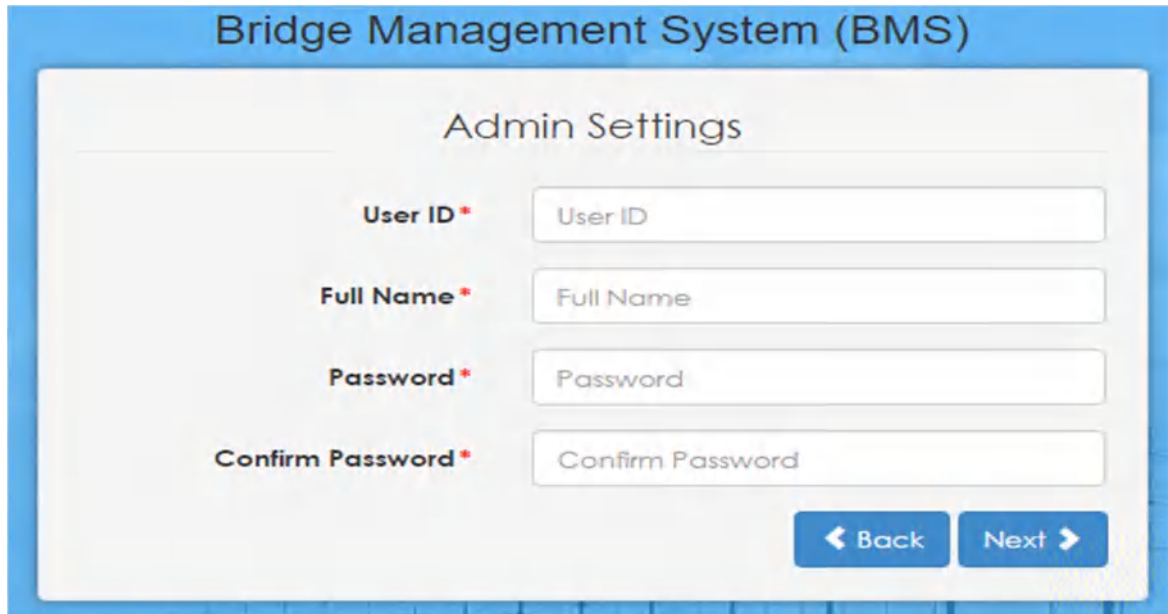
6. Enter the database settings information and click next.
7. If database settings are correct a General Settings screen will show up.

The screenshot shows the 'General Configurations' screen of the Bridge Management System (BMS). The title 'Bridge Management System (BMS)' is at the top. Below it, the section 'General Configurations' contains three fields: 'Application Name' with the value 'Bridge Management System', 'Application Short Name' with the value 'BMS', and 'Default Timezone' with a dropdown menu showing 'Asia/Dhaka [BDT +06:00]'. At the bottom right, there are two buttons: 'Back' and 'Next'.

8. Input the Application Name (For example Bridge Management System or anything else that best names the application), Application short name (Like BMS or anything else that best names the application) and Select Time Zone (Like Asia/Dhaka [BDT +06:00]).
9. Click next and Email Settings screen will show up.

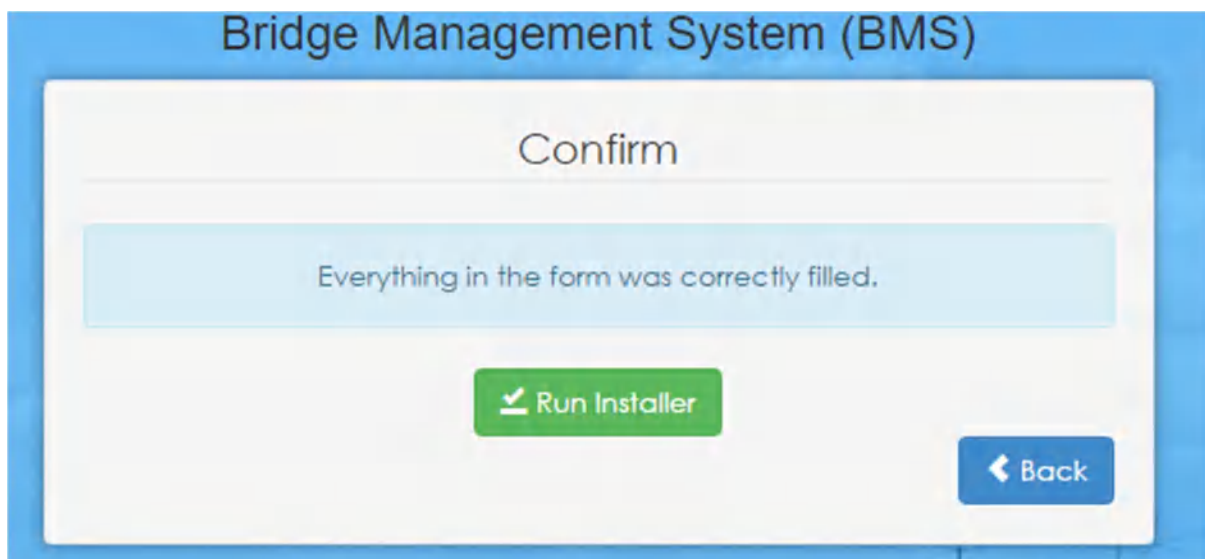
The screenshot shows the 'Email Options' screen of the Bridge Management System (BMS). The title 'Bridge Management System (BMS)' is at the top. Below it, the section 'Email Options' contains seven fields: 'Email address from', 'Name from', 'Email Subject', 'SMTP Server', 'SMTP Port', 'SMTP Login', and 'SMTP Password'. At the bottom right, there are two buttons: 'Back' and 'Next'.

10. Input the email settings.
11. Click next and Admin Settings screen will show up.



The image shows the 'Admin Settings' screen of the Bridge Management System (BMS). The screen has a blue header with the title 'Bridge Management System (BMS)'. Below the header, the title 'Admin Settings' is centered. There are four input fields, each with a label and a red asterisk indicating it is required: 'User ID', 'Full Name', 'Password', and 'Confirm Password'. Each field contains a placeholder text matching its label. At the bottom right, there are two blue buttons: 'Back' with a left arrow and 'Next' with a right arrow.

12. Input the BMS Admin user id and password.
13. Click next and "Run Installer" screen will show up.



The image shows the 'Confirm' screen of the Bridge Management System (BMS). The screen has a blue header with the title 'Bridge Management System (BMS)'. Below the header, the title 'Confirm' is centered. A light blue message box contains the text 'Everything in the form was correctly filled.' Below the message box, there is a green button with a checkmark icon and the text 'Run Installer'. At the bottom right, there is a blue button with a left arrow and the text 'Back'.

14. Click on "Run Installer" button and wait until the installation completes.

A P P E N D I X

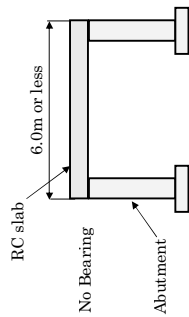
A P P E N D I X
BASIC KNOWLEDGE OF BRIDGE

Bridge and Culvert Type

<Concrete Bridge >

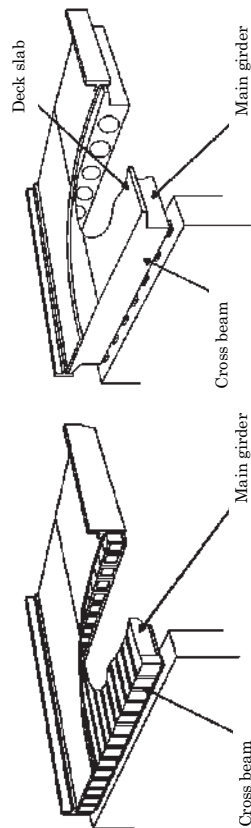
1. Small Slab Bridge (Former "Slab Culvert")

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.



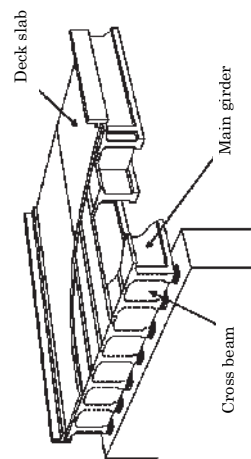
2. RC Slab Bridge

In general, the span is less than 16m



3. RC Girder Bridge

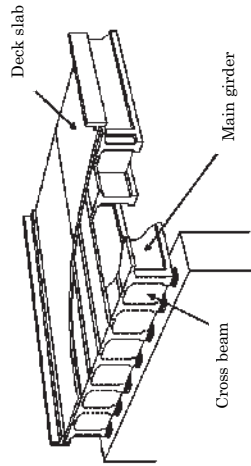
In general, the span is less than 20m. In special case It can be less than 30m



Bhuvagati Bridge in SirajGanj

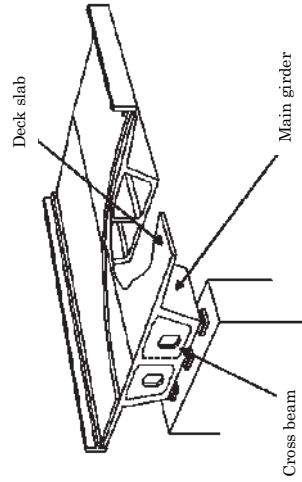
4. PC Girder Bridge

In general, the span is more than 20m



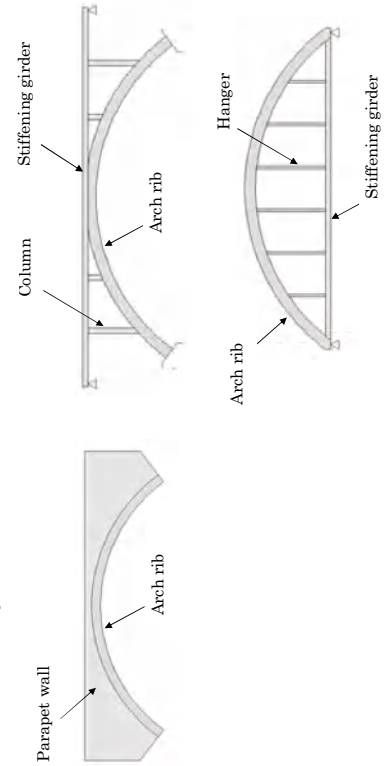
Kanchpur Bridge in Narayanganj

5. PC Box Girder Bridge

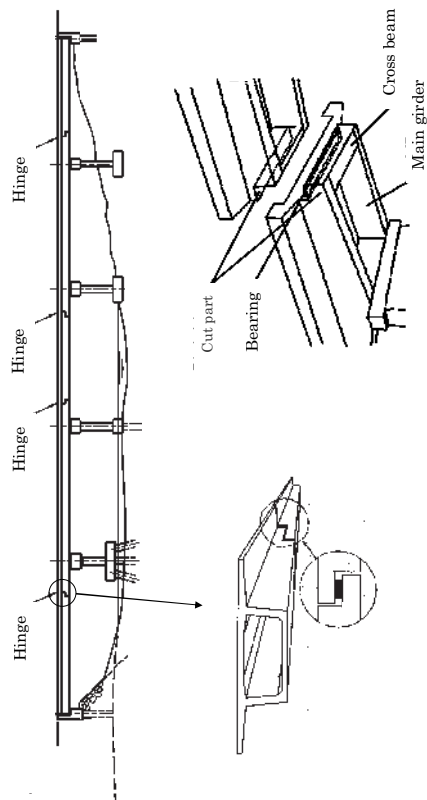


Rupsha Bridge

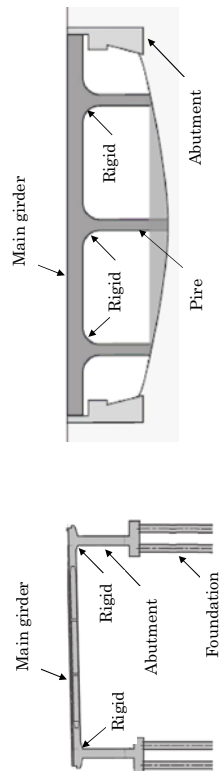
6. Concrete Arch Bridge



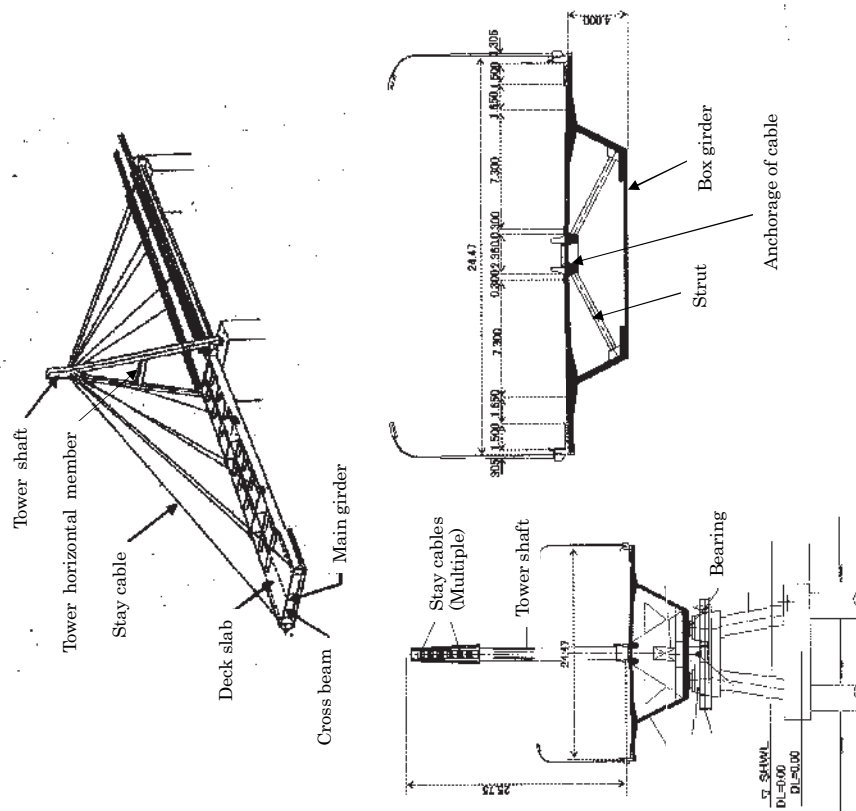
7. Cantilever Bridge with Hinge



8. Rigid Frame Bridge



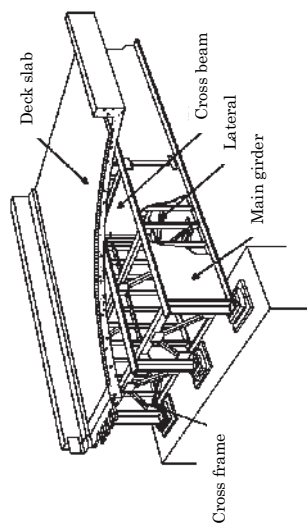
9. Cable- Stayed Bridge



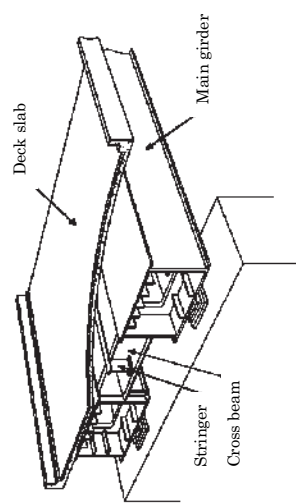
Section and elements of the 3rd Kamaphuli Bridge (Extradosed bridge)

< Steel Bridge >

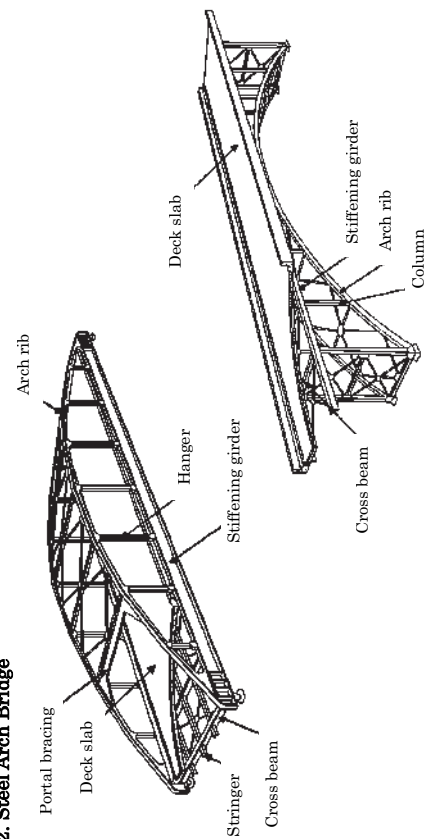
10. Steel Girder Bridge



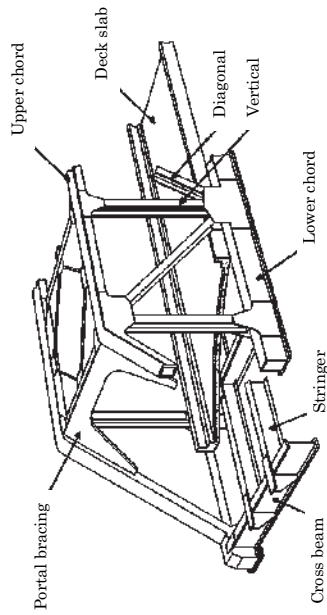
11. Steel Box Girder Bridge



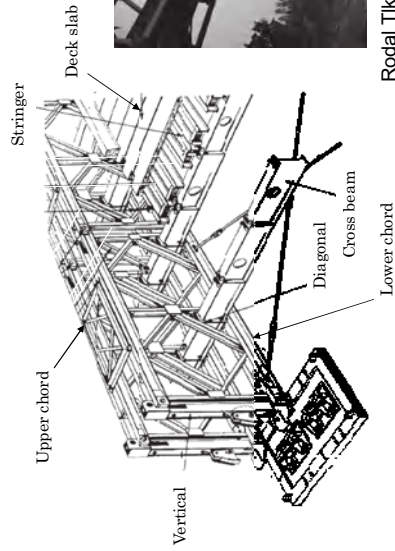
12. Steel Arch Bridge



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



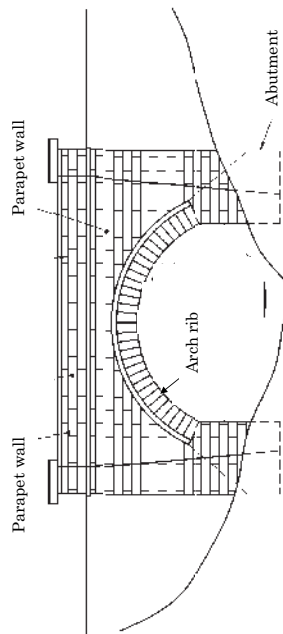
- 16. Portable Steel Bridge with Steel Deck
- 17. Portable Steel Bridge with Timber Deck



Rodal Tiki Portable Steel Bridge in Manikganj

< Masonry Arch Bridge >

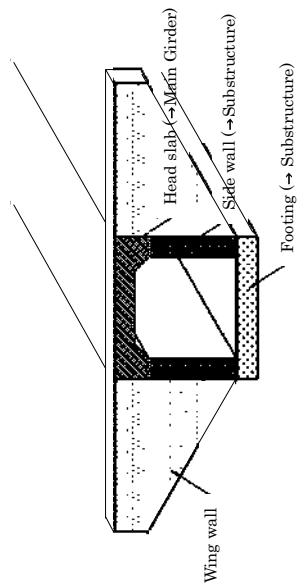
18. Masonry Arch Bridge



< Culvert >

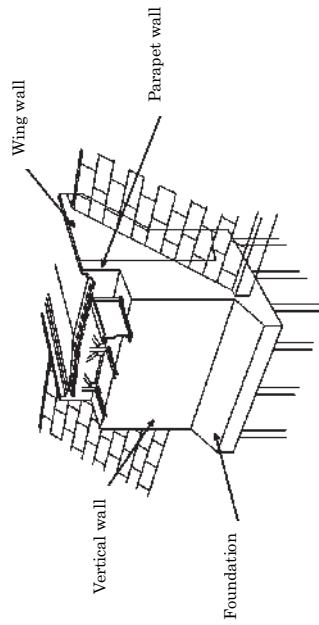
19. Box Culvert

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.

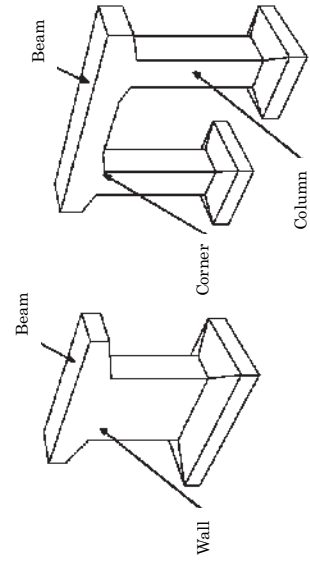
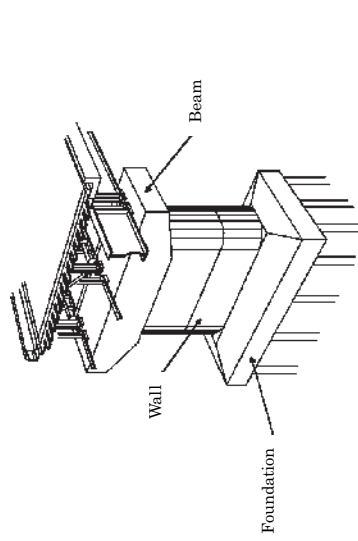


Substructure Type

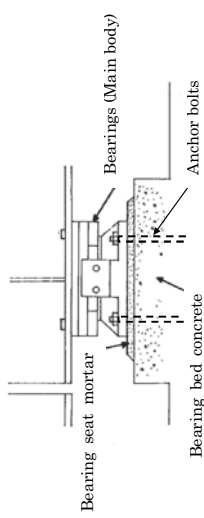
< Abutment >



< Pier >

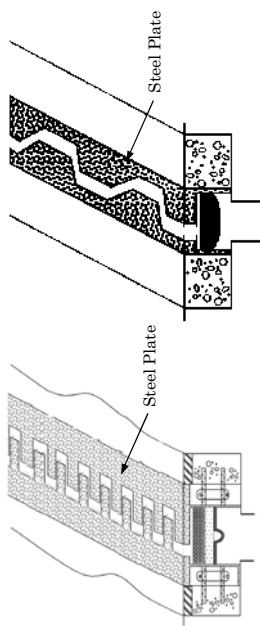


Bearings

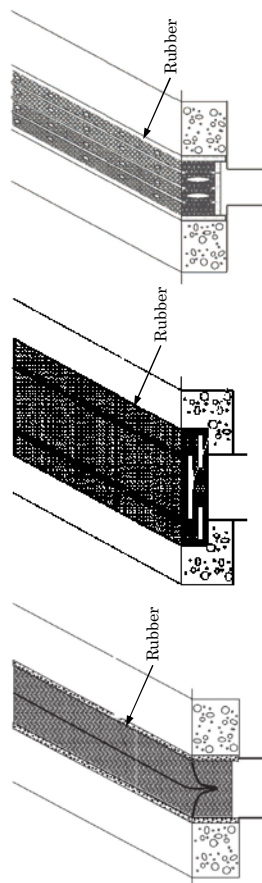


Expansion Joint

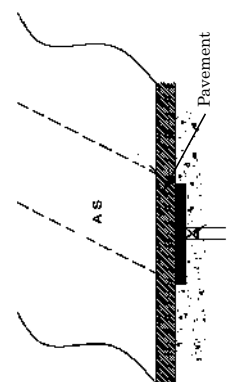
<Steel>



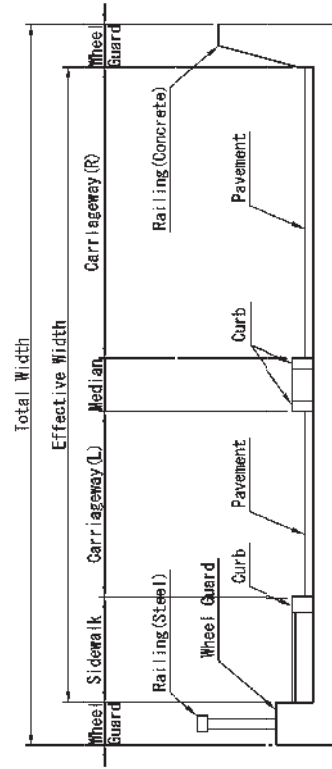
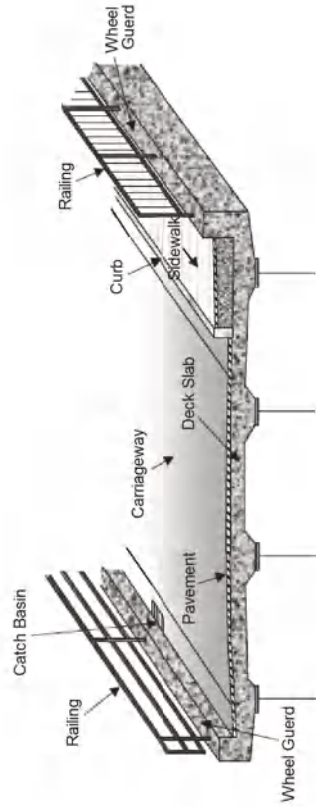
<Rubber>



<Others>



Deck Surface



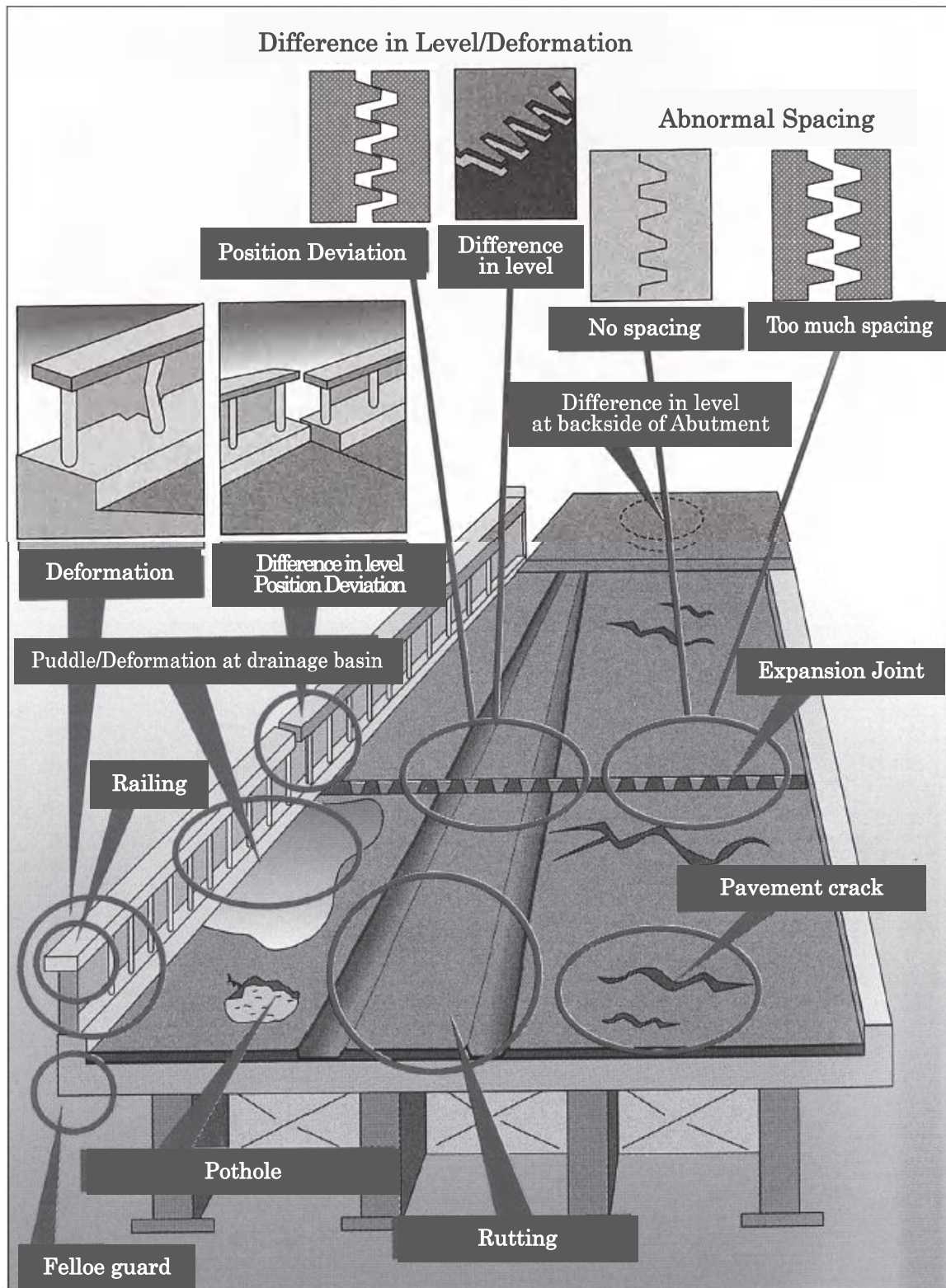
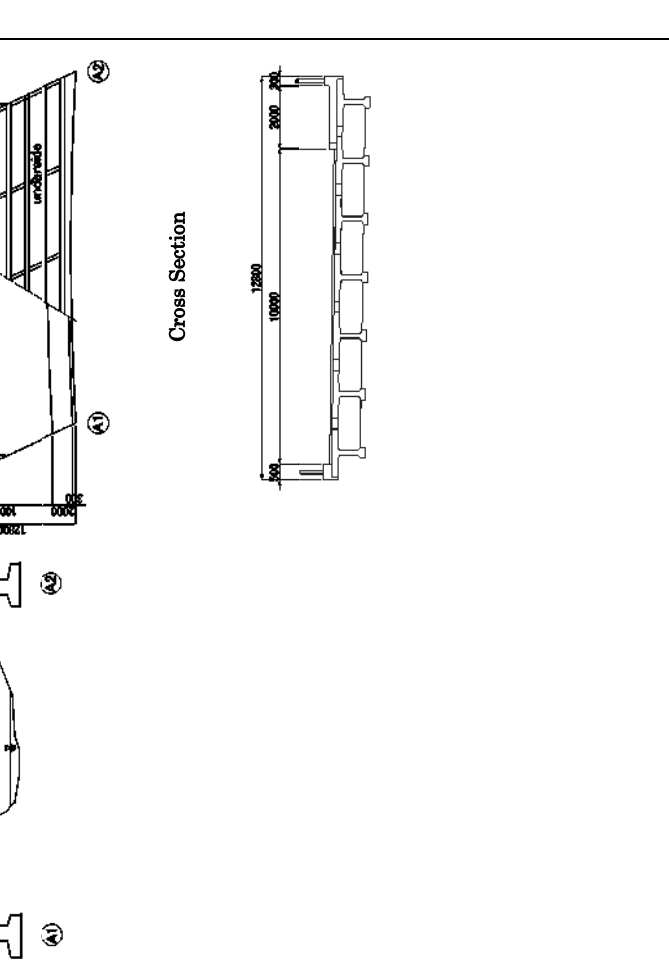


Figure Summary of Possible Defects and Locations

A P P E N D I X

RECORDING OF INVENTORY AND RESULT

General Drawings		Bridge Number	Bridge Name	Yamato Bridge	Route Name
General View Side View Plan					



Element Numbering System			
Bridge Number	Bridge Name	Yamato Bridge	Route Name
1			Span No.

Main Girder (Mg)

Deck Slab (Ds)

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	Side View
						Date	
						Date	
						Date	

Defect Photos						
Bridge Number			Bridge Name		Yamato Bridge	
Span No.	1	Photo No.	18	Span No.	1	Photo No.
Element	Main Girder	Defect	Spalling/Rebar Exposure	Element	Main Girder	Defect
		Rating	e			Rating
						
Span No.	1	Photo No.	25	Span No.	1	Photo No.
Element	Main Girder	Defect	Spalling/Rebar Exposure	Element	Cross Beam	Leakage/Efflorescence
		Rating	d			d
						
Span No.	1	Photo No.	33	Span No.	1	Photo No.
Element	Deck Slab	Defect	Crack of Deck Slab	Element	Deck Slab	Spalling/Rebar Exposure
		Rating	d			d
						

[illegible]

Bridge Evaluation Report Form

File Number	Bridge Name	Yamato Bridge	Superstructure	PC Girder Bridge	Year	1972		
Zone			Division		Sub-Division			
Evaluation Result	Circle			Span No.	1	Page No.		
Component	Element Type	Material	Type of Defects	AI No Repair	BT Minor Repair	CI Major Repair		
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	✓				
			7. Spalling / Exposed Rebar		✓			
			8. Water leakage / Efflorescence	✓				
			11. Delamination	✓				
			12. Abnormal Spacing	✓				
	Others	Others	16. Other Types of Defects	✓				
			17. Defects of Reinforcing material	✓				
			18. Abnormal Anchorage	✓				
			19. Discoloration / Deterioration	✓				
			20. Water Leakage / Puddle	✓				
	Common	Common	21. Abnormal Noise / Vibration	✓				
			22. Abnormal Deflection	✓				
			23. Deformation / Break	✓				
			* Primary element	* Primary element	1. Corrosion			
					2. Crack in Steel			
	3. Loose or Missing Bolts							
	4. Fracture							
	5. Deterioration of Paint System							
Cross Beam	Concrete	Concrete	6. Crack	✓				
			7. Spalling / Exposed Rebar	✓				
			8. Water leakage / Efflorescence	✓				
			11. Delamination	✓				
			16. Other Types of Defects	✓				
	Others	Others	17. Defects of Reinforcing material	✓				
			18. Abnormal Anchorage	✓				
			19. Discoloration / Deterioration	✓				
			21. Abnormal Noise / Vibration	✓				
			22. Abnormal Deflection	✓				
	* Primary element	* Primary element	23. Deformation / Break	✓				
			Steel	Steel	1. Corrosion			
					2. Crack in Steel			
					3. Loose or Missing Bolts			
					4. Fracture			
	5. Deterioration of Paint System							
	Lateral Bracing	Others	Others	16. Other Types of Defects				
				17. Defects of Reinforcing material				
				21. Abnormal Noise / Vibration				
				23. Deformation / Break				
				Common	Common	1. Corrosion		
		2. Crack in Steel						
		3. Loose or Missing Bolts						
4. Fracture								
5. Deterioration of Paint System								
Deck Slab		Concrete	Concrete	7. Spalling / Exposed Rebar	✓			
				8. Water leakage / Efflorescence	✓			
				9. Fallen out of Deck Slab	✓			
				10. Crack of Deck Slab		✓		
				11. Delamination	✓			
		Others	Others	16. Other Types of Defects	✓			
				17. Defects of Reinforcing material	✓			
				18. Abnormal Anchorage	✓			
				19. Discoloration / Deterioration	✓			
				20. Water Leakage / Puddle	✓			
		* Primary element	* Primary element	23. Deformation / Break	✓			

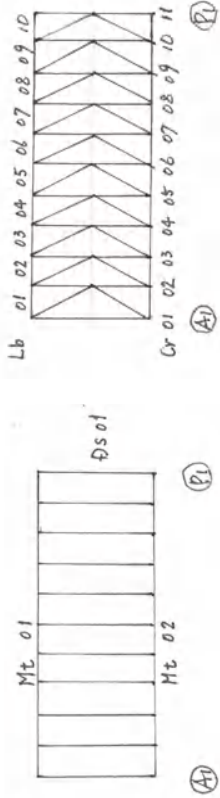
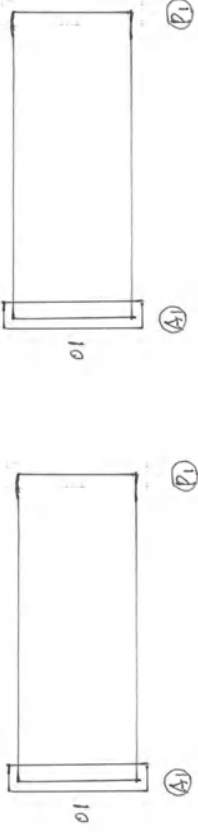
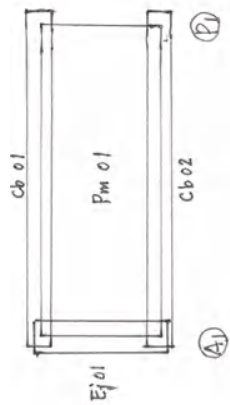
Bridge Evaluation Report Form

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Periodic Inspection/Evaluation Report Form (Sample)

File Number		Inspector				Date	
Zone	Rajshahi	Circle	Fabna	Division	Sirajganj	Sub-Division	Sirajganj-1
District		Upazilla		Union		Village	
Road No.	R451	Road Name	Nalka-Sirajganj Road		LRP Name	LRP001	GPS Lat Long 24d-25'-47" 89d-36'-4"
Bridge Name	Naiori Bridge	LRP+Offset (m)			Chainage (km)	0.907	
Year of Construction	1980	Design Standard	Design Load		Load Restriction		
Feature Intersected	River	Owner	Owner	Public Utilities Carried	telephone line water	Owner	(ton)
	Road	Owner	Owner			Owner	
	Railway	Owner	Owner				
Bridge Length	50.08	No. of Spans	2	Span Arrangement	25+25	Skew Angle (degree)	90
Superstructure	Portable Steel Bridge with Steel Deck	Type	Material	Deck Slab	Steel	Type	Material
Abutment	Inverted T-type		Concrete	Foundation (Abutment)	Piled		---
Pier	Wall Type		Concrete	Foundation (Pier)	Piled		---
Pavement	None			Bearings	Steel		Steel
Other Elements	Expansion Joint/None			Railing	None		
Total Width	7.50 m	Wheel Guard-L	0.1 m	Median	0.0 m	Sidewalk-R	0.1 m
Effective Width	6.05 m	Sidewalk-L	0.0 m	Carriage way-L	7.30 m	Carriage way-R	0.0 m
		Wheel Guard-R	0.1 m			Sidewalk-R	0.0 m
Traffic Conditions	Census (year)	Heavy Vehicle Traffic Rate (%)			0~10~10~20~30~30~30~		
	Traffic Volume	Vehicles (Daytime 12 hours)			Condition Category for Entire Bridge		
		35			B		

General Drawings		Bridge Name		Naiori Bridge		Route Name	
Bridge Number							
General View							
Plan							
Cross Section							

Element Numbering System		Bridge Name	Route Name	Span No.	1
Bridge Number					
Main Truss (Mt)					
Deck Slab (Ds)					
					
Substructure				Bearing(Br)	
Abutment(A) , Foundation(F)					
					
Curb(Cb)				Expansion Joint (Ej), Pavement (Pm)	
					

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

Defect Sketch		Bridge Number	Bridge Name	Naiori Bridge	Route Name
Crack Delamination Spalling / Exposed Rebar Water Leakage / Efflorescence Water Leakage / Puddle Deformation / Break Corrosion Other Defect Expansion Joint Difference in Level Photo No. 4 Bearing Photo No. 3 Accumulation of debris Deck Slab Break Photo No. 2 Photo No. 1 Deck Slab Corrosion Photo No. 1 Photo No. 2					

Element Numbering System		Bridge Number	Bridge Name	Naiori Bridge	Route Name	Span No.	2
Main Truss (Mt) Deck Slab (Ds) Mt 01 Ds 01 Mt 02 Ds 02 Lb 01 02 03 04 05 06 07 08 09 10 Cr 01 02 03 04 05 06 07 08 09 10 11 A2							
Substructure Abutment(A) ,Pier(P), Foundation(F) 01 02 A2 P1 01 02 A2 P1							
Bearing(Br) 01 02 A2 P1 01 02 A2 P1							
Curb(Cb) Expansion Joint (Ej), Pavement (Pm) Cb 01 Pm 01 Cb 02 Ej 01 Ej 02 A2 P1 Cb 01 Pm 01 Cb 02 Ej 01 Ej 02 A2 P1							

Bridge Evaluation Report Form

File Number	Bridge Name		Natori Bridge	Evaluator	KONISHI, Toshiyuki		Date	
Zone	Rajshahi	Circle	Pabna	Superstructure	PSS with Steel Deck	Year	1980	
Evolution Result	Bridge Name		Circle	Material	Type of Defects	Span No.	Page No.	
Component	Element Type	Material	Type of Defects	At No Repair	Minor Repair	Major Repair	Detailed investigation	
Superstructure	Main Girder	Steel	1.Corrosion	✓				
			2.Crack in Steel	✓				
			3.Loose or Missing Bolts	✓				
			4.Fracture	✓				
			5.Deterioration of Paint System	✓				
			6.Crack					
	Main Truss	Concrete	7.Spalling / Exposed Rebar					
			8.Water leakage /Efflorescence					
			11.Delamination					
			12.Abnormal Spacing	✓				
	Main Tower	Others	16.Other Types of Defects	✓				
			17.Defects of Reinforcing material	✓				
			18.Abnormal Anchorage					
			19.Discoloration / Deterioration					
	Arch Rib	Common	20.Water Leakage / Puddle	✓				
			21.Abnormal Noise / Vibration	✓				
			22.Abnormal Deflection	✓				
			23.Deformation / Break	✓				
	* Primary element							
	Cross Beam	Steel	1.Corrosion	✓				
2.Crack in Steel			✓					
3.Loose or Missing Bolts			✓					
4.Fracture			✓					
5.Deterioration of Paint System			✓					
6.Crack								
Sillinger	Concrete	7.Spalling / Exposed Rebar						
		8.Water leakage /Efflorescence						
		11.Delamination						
		16.Other Types of Defects	✓					
		17.Defects of Reinforcing material	✓					
		18.Abnormal Anchorage						
Primary element	Common	19.Discoloration / Deterioration						
		21.Abnormal Noise / Vibration	✓					
		22.Abnormal Deflection						
		23.Deformation / Break	✓					
		1.Corrosion	✓					
		2.Crack in Steel	✓					
Lateral Bracing	Steel	3.Loose or Missing Bolts	✓					
		4.Fracture	✓					
		5.Deterioration of Paint System	✓					
		16.Other Types of Defects	✓					
		17.Defects of Reinforcing material	✓					
		21.Abnormal Noise / Vibration	✓					
Secondary element	Common	23.Deformation / Break	✓					
		1.Corrosion	✓					
		2.Crack in Steel	✓					
		3.Loose or Missing Bolts	✓					
		4.Fracture	✓					
		5.Deterioration of Paint System	✓					
Deck Slab	Concrete	7.Spalling / Exposed Rebar						
		8.Water leakage /Efflorescence						
		9.Fallen out of Deck Slab						
		10.Crack of Deck Slab						
		11.Delamination						
		16.Other Types of Defects	✓					
Reinforcement element	Common	17.Defects of Reinforcing material	✓					
		18.Abnormal Anchorage						
		19.Discoloration / Deterioration						
		20.Water Leakage / Puddle	✓					
		21.Abnormal Noise / Vibration						
		22.Abnormal Deflection						

Bridge Evaluation Report Form

File Number	Zone	Rajshahi	Bridge Name	Naori Bridge	Superstructure	PSB with Steel Deck	Date	23.08.15
Zone	Circle	Pabna	Division	Siraganj	Sub-Division	Siraganj-1	Year	1980
Element Type	Material	Type of Defects	Span No.	1	Page No.	3/3	Remarks	
Pavement	Others	13.Difference in Level	At No Repair	BT	DI	Public Safety	Detailed Invest-igation	
- Secondary element	Common	14.Abnormal Bituminous Pavement						
Bridge Approaches	Others	15.Other Types of Defects						
- Secondary element	Common	16.Accumulation of Debris						
Expansion Joints (Rubber / Steel)	Concrete	13.Difference in Level						
> Including		14.Abnormal Bituminous Pavement						
- elements of post-cast concrete		16.Other Types of Defects						
- Secondary element	Common	24.Accumulation of Debris						
Railing (Steel / Concrete)	Steel	1.Corrosion						
> Including		2.Crack in Steel						
- Median		3.Loose or Missing Bolts						
- Curb		4.Fracture						
- Secondary element	Common	5.Deterioration of Paint System						
Drainage System	Concrete	6.Crack						
> Including		7.Spalling / Exposed Rebar						
- Catch-Basin		8.Water leakage / Efflorescence						
- Drainage Pipe		11.Delamination						
- Secondary element	Common	16.Other Types of Defects						
Lighting Facility	Steel	19.Discoloration / Deterioration						
Road Sign Facility		23.Deformation / Break						
- Secondary element	Common	1.Corrosion						
Inspection Facility	Steel	2.Crack in Steel						
Utility Pipe		3.Loose or Missing Bolts						
- Secondary element	Common	4.Fracture						
Inspection Facility	Others	5.Deterioration of Paint System						
Utility Pipe		16.Other Types of Defects						
- Secondary element	Common	19.Discoloration / Deterioration						
Inspection Facility	Steel	23.Deformation / Break						
Utility Pipe		1.Corrosion						
- Secondary element	Common	2.Crack in Steel						
Inspection Facility	Others	3.Loose or Missing Bolts						
Utility Pipe		4.Fracture						
- Secondary element	Common	5.Deterioration of Paint System						
Inspection Facility	Steel	16.Other Types of Defects						
Utility Pipe		21.Abnormal Noise / Vibration						
- Secondary element	Common	23.Deformation / Break						

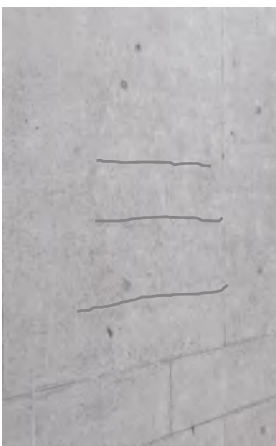
Periodic Inspection/Evaluation Report Form (Sample)

File Number	N6-LRP098-00011130										Inspector			Date
Zone	Dhaka	Circle	Dhaka	Division	Manikganj	Sub-Division	Nayrhat							
District	-	Upazila	-	Union	-	Village	-							
Road No.	N5	Road Name	Dhaka(Mirpur)-Utholi-Paturia					LRP Name	LRP098	GPS	Lat	23 91 889		
Bridge Name	Sreerampur Box Culvert	LRP-Offset (m)						Chainage (km)	0.679	Long	90.12111			
Year of Construction	1998	Design Standard						Load Restriction		(ton)				
Feature Intersected	River	Owner						Public Utilities Carried	telephone line	Owner				
	Road	Owner							water	Owner				
	Railway	Owner												
Bridge Length	30.500	No. of Spans	5	Span Arrangement	5.700+5.700+5.700+5.700+5.700					Skew Angle (degree)	90			
Superstructure	Box Culvert	Material	Concrete	Type	Deck Slab	RC	Material	Concrete						
Substructure	Abutment	Concrete			Foundation (Abutment)	Piled	Material	Concrete						
	Pier	Concrete			Foundation (Pier)	Piled	Material	Concrete						
Other Elements	Pavement	Asphalt			Bearings	None								
	Expansion Joint	None			Railing	Steel								
Total Width	8.30	m	Wheel Guard-L	0.0	m	0.0	Median	0.0	m	0.0	Wheel Guard-R	0.0		
Effective Width	7.00	m	Sidewalk-L	0.65	m	7.00	Carriage way-L	0.0	m	0.65	Sidewalk-R	0.0		
Traffic Conditions	Census (year)	Heavy Vehicle Traffic												
	Traffic Volume	Condition Category												
		0~10~10~20~30~30~30~												
		Vehicles (Daytime 12 hours)												
		for Entire Bridge												

General Drawings		Bridge Number	Bridge Name	Sreerampur BoxCulvert	Route Name
General View					
Plan			Cross Section		

Element Numbering System		Bridge Name	Sreerampur BoxCulvert	Route Name	Span No.
Bridge Number					
Top slab TS 01. Route direction Side Wall (SW), Footing (F) Retaining Wall (RW) Pavement (Pm) Railing (Ra)					

Overall View Photo	Bridge Number	Bridge Name	Sreerampur BoxCulvert	Route Name	Viewpoint		Side View
					Date		
					Viewpoint		19/07/17
					Date		
					Viewpoint		19/07/17
					Date		
					Viewpoint		19/07/17
					Date		

Defects Photos							
Bridge Number		Bridge Name		Sreerampur BoxCulvert		Route Name	
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 Slab	Defect	Crack	Element	Top Slab	Defect	Crack
		Rating	d			Rating	c
							
Span No.	6	Photo No.	3	Span No.		Photo No.	
Element	Retaining Wall	Defect	Crack	Element		Defect	
		Rating	d			Rating	
							

Defect Sketch	Bridge Number	Bridge Name	Sreerampur BoxCulvert	Route Name

Periodic Inspection Report Form

Bridge Evaluation Report Form

File Number	Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert	Date
Zone	Circle		Division	Sub-Division	Year
Evaluation Result					1938
Component	Element Type	Material	Type of Defects	Span No.	Page No.
				At No Repair	Detailed Invest-igation
				Minor Repair	Public Safety
				Major Repair	

[illegible]

Bridge Evaluation Report Form

Bridge Evaluation Report Form

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

Bridge Evaluation Report Form

Bridge Evaluation Report Form

File Number Zone	Bridge Name	Circle	Nagamachi Bridge	Supersubstructure	Box Culvert	Sub-Division	Year	1938
Evaluation Result	Material	Type of Defects	Span No.	Sub-Division	Span No.	Sub-Division	Page No.	2/3
Component	Material	Type of Defects	Span No.	Sub-Division	Span No.	Sub-Division	Page No.	2/3
Abutment	Steel	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 6. Crack 7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 11. Delamination 16. Other Types of Defects 17. Defects of Reinforcing material 19. Discoloration / Deterioration 20. Water Leakage / Puddle 21. Abnormal Noise / Vibration 23. Deformation / Break						
Pier	Concrete							
Side Wall	Others							
Parapet Wall	Common							
* Primary element	Steel	1. Corrosion 2. Crack in Steel 5. Deterioration of Paint System 6. Crack 7. Spalling / Exposed Rebar 16. Other Types of Defects 25. Settlement / Tilt / Movement 26. Scouring						
Foundation	Concrete							
Footing	Others							
* Primary element	Common							
Retaining Wall	Concrete	6. Crack 7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 11. Delamination 16. Other Types of Defects 17. Defects of Reinforcing material 19. Discoloration / Deterioration 23. Deformation / Break 25. Settlement / Tilt / Movement 26. Scour						
- Secondary element	Others							
Bearing Main Body	Steel (Rubber)	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 12. Abnormal Spacing 15. Function Disorder of Bearings 16. Other Types of Defects 20. Water Leakage / Puddle 21. Abnormal Noise / Vibration 23. Deformation / Break 24. Accumulation of Debris 25. Settlement / Tilt / Movement						
Anchor Bolts	Others							
* Primary element	Common							
Bearing Seat Mortar	Concrete	6. Crack 7. Spalling / Exposed Rebar 11. Delamination 16. Other Types of Defects 20. Water Leakage / Puddle 23. Deformation / Break						
Bearing Bed concrete	Others							
* Primary element	Common							

Periodic Inspection/Evaluation Report Form (Sample)

File Number		N1, 8b		Inspector				Date	
Zone	Dhaka	Circle	Dhaka	Division	Narayangj-1		Sub-Division	Narayangj-1	
District	Upazila			Union			Village		
Road No.	N1	Road Name		Dhaka(Jatrabari)-Comilla Chittagong-Taknaf	LRP Name	8b	GPS	Lat Long	
				LRP+Offset (m)	5+3976		Chainage (km)	23d-42'-7.5" 90d-30'-57.3"	
Bridge Name	Naganachi Bridge			Design Standard	Design Load	TL-20		Load Restriction	
Year of Construction	1988							6 (ton)	
Feature Intersected	River			Owner	Public Utilities Carried		telephone line water		
	Road			Owner			Owner		
	Railway			Owner					
Bridge Length	4.420	No. of Spans	1	Span Arrangement	4.420	Skew Angle (degree)		63	
		Type		Material		Type		Material	
Superstructure	Box Culvert			Concrete		RC		Concrete	
Substructure	Abutment	---				Foundation (Abutment)		Steel	
	Pier	---				Foundation (Pier)			
Other Elements	Pavement	Asphalt				Bearings		None	
	Expansion Joint	None				Railing		Steel	
Traffic Volume	Total Width	6.05	Wheel Guard-L	m	Sidewalk-L	Carriage way-L	Median	Sidewalk-R	
	Effective Width	6.05	m	0.2	m	0.0	m	0.0	
Traffic Conditions	Census (year)					Heavy Vehicle Traffic Rate (%)		Wheel Guard-R	
								0~10~10~20~30~30~30~	
Condition Category		For Entire Bridge		36		B			

The drawing consists of four orthographic views of a bridge structure:

- General View:** A perspective view of the bridge showing its overall form, including the deck, supports, and a central vertical element.
- Side View:** A side elevation of the bridge. It shows a rectangular structure with a width of 1000 units and a height of 2000 units. The structure is supported by two vertical posts, labeled (1) and (2).
- Plan:** A top-down view of the bridge. It shows a rectangular structure with a width of 1000 units and a length of 2000 units. The structure is supported by two vertical posts, labeled (1) and (2).
- Cross Section:** A cross-sectional view of the bridge. It shows a rectangular structure with a width of 1000 units and a height of 2000 units. The structure is supported by two vertical posts, labeled (1) and (2).

Element Numbering System		Bridge Name	Route Name	Span No.	1
Bridge Number		Nagamachi Bridge			
Top Slab (Ts) Ts 01 (A1) (A2) Side Wall (S), Footing (F) S 01 F 01 S (A1) (A2) Railing (Ra), Wheel Guard(Wg) Expansion Joint (Ej), Pavement (Pm) Ra 01 Wg Ej 01 Pm 01 Ej 02 Wg Ra 02 (A1) (A2)					

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

Defect Photos				Bridge Name		Nagamachi Bridg		Route Name	
Bridge Number		1		Photo No.		Span No.		1	
Span No.	Element	Top Slab	Defect	Photo No.	Defect	Span No.	Element	Top Slab	Defect

Periodic Inspection Report Form

File Number		Inspector		Date	
Zone	Bridge Name	Superstructure	Box Culvert	Year	1938
Survey Result		No. of Hinge		Span No.	
Items of Defects		0		1	
Steel Material		Concrete Material		Remarks	
Corrosion		Crack		Settlement/Tilt/Movement	
Crack		Crack		Accumulation of Debris	
Loose or Missing Bolts		Crack		Deformation/Break	
Fracture		Crack		Abnormal Deflection	
Deterioration of Paint System		Crack		Abnormal Noise/Vibration	
Water Leakage/Exposed Rebar		Crack		Water Leakage/Puddle	
Spalling/Exposed Rebar		Crack		Discoloration/deterioration	
Water Leakage/Efflorescence		Crack		Abnormal Anchorage	
Fallen out of Deck Slab		Crack		Defects of Reinforced Materials	
Crack of Deck Slab		Crack		Others	
Delamination		Crack		Functional disorder of Bearings	
Abnormal Spacing		Crack		Abnormal Bituminous Pavement	
Difference in Level		Crack		Difference in Level	
Abnormal		Crack		Abnormal	
1		Crack		1	
2		Crack		2	
3		Crack		3	
4		Crack		4	
5		Crack		5	
6		Crack		6	
7		Crack		7	
8		Crack		8	
9		Crack		9	
10		Crack		10	
11		Crack		11	
12		Crack		12	
13		Crack		13	
14		Crack		14	
15		Crack		15	
16		Crack		16	
17		Crack		17	
18		Crack		18	
19		Crack		19	
20		Crack		20	
21		Crack		21	
22		Crack		22	
23		Crack		23	
24		Crack		24	
25		Crack		25	
26		Crack		26	
Top Slab		Crack		Crack	
Side Wall		Crack		Crack	
Footing		Crack		Crack	
Retaining Wall		Crack		Crack	
Railing (Steel)		Crack		Crack	
Wheel Guard		Crack		Crack	
Drainage System		Crack		Crack	
Pavement		Crack		Crack	
Bridge Approaches		Crack		Crack	
Lighting Facility		Crack		Crack	
Road Sign		Crack		Crack	
Utility Pipe		Crack		Crack	
Summary		Crack		Crack	
Recommendation		Crack		Crack	

Bridge Evaluation Report Form

File Number		Inspector		Date	
Zone	Bridge Name	Superstructure	Box Culvert	Year	1938
Evaluation Result		No. of Hinge		Span No.	
Component		0		1	
Element Type		Concrete Material		Remarks	
Material		Crack		Settlement/Tilt/Movement	
Type of Defects		Crack		Accumulation of Debris	
1. Corrosion		Crack		Deformation/Break	
2. Crack in Steel		Crack		Abnormal Deflection	
3. Loose or Missing Bolts		Crack		Abnormal Noise/Vibration	
4. Fracture		Crack		Water Leakage/Puddle	
5. Deterioration of Paint System		Crack		Discoloration/deterioration	
6. Crack		Crack		Abnormal Anchorage	
7. Spalling / Exposed Rebar		Crack		Defects of Reinforced Materials	
8. Water leakage / Efflorescence		Crack		Others	
11. Delamination		Crack		Functional disorder of Bearings	
12. Abnormal Spacing		Crack		Abnormal Bituminous Pavement	
16. Other Types of Defects		Crack		Difference in Level	
17. Defects of Reinforcing material		Crack		Abnormal	
18. Abnormal Anchorage		Crack		1	
19. Discoloration / Deterioration		Crack		2	
20. Water Leakage / Puddle		Crack		3	
21. Abnormal Noise / Vibration		Crack		4	
22. Abnormal Deflection		Crack		5	
23. Deformation / Break		Crack		6	
1. Corrosion		Crack		7	
2. Crack in Steel		Crack		8	
3. Loose or Missing Bolts		Crack		9	
4. Fracture		Crack		10	
5. Deterioration of Paint System		Crack		11	
6. Crack		Crack		12	
7. Spalling / Exposed Rebar		Crack		13	
8. Water leakage / Efflorescence		Crack		14	
11. Delamination		Crack		15	
16. Other Types of Defects		Crack		16	
17. Defects of Reinforcing material		Crack		17	
18. Abnormal Anchorage		Crack		18	
19. Discoloration / Deterioration		Crack		19	
21. Abnormal Noise / Vibration		Crack		20	
22. Abnormal Deflection		Crack		21	
23. Deformation / Break		Crack		22	
1. Corrosion		Crack		23	
2. Crack in Steel		Crack		24	
3. Loose or Missing Bolts		Crack		25	
4. Fracture		Crack		26	
5. Deterioration of Paint System		Crack		27	
16. Other Types of Defects		Crack		28	
17. Defects of Reinforcing material		Crack		29	
Common		Crack		30	
21. Abnormal Noise / Vibration		Crack		31	
22. Abnormal Deflection		Crack		32	
23. Deformation / Break		Crack		33	
1. Corrosion		Crack		34	
2. Crack in Steel		Crack		35	
3. Loose or Missing Bolts		Crack		36	
4. Fracture		Crack		37	
5. Deterioration of Paint System		Crack		38	
16. Other Types of Defects		Crack		39	
17. Defects of Reinforcing material		Crack		40	
Common		Crack		41	
21. Abnormal Noise / Vibration		Crack		42	
23. Deformation / Break		Crack		43	
1. Corrosion		Crack		44	
2. Crack in Steel		Crack		45	
3. Loose or Missing Bolts		Crack		46	
4. Fracture		Crack		47	
5. Deterioration of Paint System		Crack		48	
16. Other Types of Defects		Crack		49	
17. Defects of Reinforcing material		Crack		50	
Common		Crack		51	
21. Abnormal Noise / Vibration		Crack		52	
23. Deformation / Break		Crack		53	
1. Corrosion		Crack		54	
2. Crack in Steel		Crack		55	
3. Loose or Missing Bolts		Crack		56	
4. Fracture		Crack		57	
5. Deterioration of Paint System		Crack		58	
16. Other Types of Defects		Crack		59	
17. Defects of Reinforcing material		Crack		60	
Common		Crack		61	
21. Abnormal Noise / Vibration		Crack		62	
23. Deformation / Break		Crack		63	
1. Corrosion		Crack		64	
2. Crack in Steel		Crack		65	
3. Loose or Missing Bolts		Crack		66	
4. Fracture		Crack		67	
5. Deterioration of Paint System		Crack		68	
16. Other Types of Defects		Crack		69	
17. Defects of Reinforcing material		Crack		70	
Common		Crack		71	
21. Abnormal Noise / Vibration		Crack		72	
23. Deformation / Break		Crack		73	
1. Corrosion		Crack		74	
2. Crack in Steel		Crack		75	
3. Loose or Missing Bolts		Crack		76	
4. Fracture		Crack		77	
5. Deterioration of Paint System		Crack		78	
16. Other Types of Defects		Crack		79	
17. Defects of Reinforcing material		Crack		80	
Common		Crack		81	
21. Abnormal Noise / Vibration		Crack		82	
23. Deformation / Break		Crack		83	
1. Corrosion		Crack		84	
2. Crack in Steel		Crack		85	
3. Loose or Missing Bolts		Crack		86	
4. Fracture		Crack		87	
5. Deterioration of Paint System		Crack		88	
16. Other Types of Defects		Crack		89	
17. Defects of Reinforcing material		Crack		90	
Common		Crack		91	
21. Abnormal Noise / Vibration		Crack		92	
23. Deformation / Break		Crack		93	
1. Corrosion		Crack		94	
2. Crack in Steel		Crack		95	
3. Loose or Missing Bolts		Crack		96	
4. Fracture		Crack		97	
5. Deterioration of Paint System		Crack		98	
16. Other Types of Defects		Crack		99	
17. Defects of Reinforcing material		Crack		100	
Common		Crack		101	
21. Abnormal Noise / Vibration		Crack		102	
23. Deformation / Break		Crack		103	
1. Corrosion		Crack		104	
2. Crack in Steel		Crack		105	
3. Loose or Missing Bolts		Crack		106	
4. Fracture		Crack		107	
5. Deterioration of Paint System		Crack		108	
16. Other Types of Defects		Crack		109	
17. Defects of Reinforcing material		Crack		110	
Common		Crack		111	
21. Abnormal Noise / Vibration		Crack		112	
23. Deformation / Break		Crack		113	
1. Corrosion		Crack		114	
2. Crack in Steel		Crack		115	
3. Loose or Missing Bolts		Crack		116	
4. Fracture		Crack		117	
5. Deterioration of Paint System		Crack		118	
16. Other Types of Defects		Crack		119	
17. Defects of Reinforcing material		Crack		120	
Common		Crack		121	
21. Abnormal Noise / Vibration		Crack		122	
23. Deformation / Break		Crack		123	
1. Corrosion		Crack		124	
2. Crack in Steel		Crack		125	
3. Loose or Missing Bolts		Crack		126	
4. Fracture		Crack		127	
5. Deterioration of Paint System		Crack		128	
16. Other Types of Defects		Crack		129	
17. Defects of Reinforcing material		Crack		130	
Common		Crack		131	
21. Abnormal Noise / Vibration		Crack		132	
23. Deformation / Break		Crack		133	
1. Corrosion		Crack		134	
2. Crack in Steel		Crack		135	
3. Loose or Missing Bolts		Crack		136	
4. Fracture		Crack		137	
5. Deterioration of Paint System		Crack		138	
16. Other Types of Defects		Crack		139	
17. Defects of Reinforcing material		Crack		140	
Common		Crack		141	
21. Abnormal Noise / Vibration		Crack		142	
23. Deformation / Break		Crack		143	
1. Corrosion		Crack		144	
2. Crack in Steel		Crack		145	
3. Loose or Missing Bolts		Crack		146	
4. Fracture		Crack		147	
5. Deterioration of Paint System		Crack		148	
16. Other Types of Defects		Crack		149	
17. Defects of Reinforcing material		Crack		150	
Common		Crack		151	
21. Abnormal Noise / Vibration		Crack		152	
23. Deformation / Break		Crack		153	
1. Corrosion		Crack		154	
2. Crack in Steel		Crack		155	
3. Loose or Missing Bolts		Crack		156	
4. Fracture		Crack		157	
5. Deterioration of Paint System		Crack		158	
16. Other Types of Defects		Crack		159	
17. Defects of Reinforcing material		Crack		160	
Common		Crack		161	
21. Abnormal Noise / Vibration		Crack		162	
23. Deformation / Break		Crack		163	
1. Corrosion		Crack		164	
2. Crack in Steel		Crack		165	
3. Loose or Missing Bolts		Crack		166	
4. Fracture		Crack		167	
5. Deterioration of Paint System		Crack		168	
16. Other Types of Defects		Crack		169	
17. Defects of Reinforcing material		Crack		170	
Common		Crack		171	
21. Abnormal Noise / Vibration		Crack		172	
23. Deformation / Break		Crack		173	
1. Corrosion		Crack		174	
2. Crack in Steel		Crack		175	
3. Loose or Missing Bolts		Crack		176	
4. Fracture		Crack		177	
5. Deterioration of Paint System		Crack		178	
16. Other Types of Defects		Crack		179	
17. Defects of Reinforcing material		Crack		180	
Common		Crack		181	
21. Abnormal Noise / Vibration		Crack		182	
23. Deformation / Break		Crack		183	
1. Corrosion		Crack		184	
2. Crack in Steel		Crack		185	
3. Loose or Missing Bolts		Crack		186	
4. Fracture		Crack		187	
5. Deterioration of Paint System		Crack		188	
16. Other Types of Defects		Crack		189	
17. Defects of Reinforcing material		Crack		190	
Common		Crack		191	
21. Abnormal Noise / Vibration		Crack		192	
23. Deformation / Break		Crack		193	
1. Corrosion		Crack		194	
2. Crack in Steel		Crack		195	
3. Loose or Missing Bolts		Crack		196	
4. Fracture		Crack		197	
5. Deterioration of Paint System		Crack		198	
16. Other Types of Defects		Crack		199	
17. Defects of Reinforcing material		Crack		200	
Common		Crack		201	
21. Abnormal Noise / Vibration		Crack		202	
23. Deformation / Break		Crack		203	
1. Corrosion		Crack		204	
2. Crack in Steel		Crack		205	
3. Loose or Missing Bolts		Crack		206	
4. Fracture		Crack		207	
5. Deterioration of Paint System		Crack		208	
16. Other Types of Defects		Crack		209	
17. Defects of Reinforcing material		Crack		210	
Common		Crack		211	
21. Abnormal Noise / Vibration		Crack		212	
23. Deformation / Break		Crack		213	
1. Corrosion		Crack		214	
2. Crack in Steel		Crack		215	
3. Loose or Missing Bolts		Crack		216	
4. Fracture		Crack		217	
5. Deterioration of Paint System		Crack		218	
16. Other Types of Defects		Crack		219	
17. Defects of Reinforcing material		Crack		220	
Common		Crack		221	
21. Abnormal Noise / Vibration		Crack		222	
23. Deformation / Break		Crack		223	
1. Corrosion		Crack		224	
2. Crack in Steel		Crack		225	
3. Loose or Missing Bolts		Crack		226	
4. Fracture		Crack		227	
5. Deterioration of Paint System		Crack		228	
16. Other Types of Defects		Crack		229	
17. Defects of Reinforcing material		Crack		230	
Common		Crack		231	
21. Abnormal Noise / Vibration		Crack		232	
23. Deformation / Break		Crack		233	
1. Corrosion		Crack		234	
2. Crack in Steel		Crack		235	
3. Loose or Missing Bolts		Crack		236	
4. Fracture		Crack		237	
5. Deterioration of Paint System		Crack			

Bridge Evaluation Report Form

File Number Zone	Bridge Name				Nagamachi Bridge				Superstructure				Box Culvert				Date			
	Bridge Name		Circle		Division		Type of Defects		Span No.		Sub-Division		Year		1938					
	Element Type	Material	Type of Defects	Span No.	Sub-Division	Year	1938													
Component	Element Type	Material	Type of Defects	Span No.	Sub-Division	Year	1938													
Substructure	Abutment Pier Side Wall Parapet Wall	Steel	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture	1	DI	Public Safety	2/3													
		Concrete	5. Deterioration of Paint System 6. Crack 7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 11. Delamination	1	DI	Public Safety	2/3													
		Others	16. Other Types of Defects	1	DI	Public Safety	2/3													
		Common	17. Defects of Reinforcing material 19. Discoloration / Deterioration 20. Water Leakage / Puddle 21. Abnormal Noise / Vibration 23. Deformation / Break	1	DI	Public Safety	2/3													
		* Primary element	1. Corrosion 2. Crack in Steel 5. Deterioration of Paint System 6. Crack 7. Spalling / Exposed Rebar 16. Other Types of Defects	1	DI	Public Safety	2/3													
		Foundation	Steel	1. Corrosion 2. Crack in Steel 5. Deterioration of Paint System 6. Crack	1	DI	Public Safety	2/3												
		Footing	Concrete	7. Spalling / Exposed Rebar 16. Other Types of Defects	1	DI	Public Safety	2/3												
		Common	25. Settlement / Tilt / Movement 26. Scouring	1	DI	Public Safety	2/3													
		* Primary element	6. Crack 7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 11. Delamination 16. Other Types of Defects	1	DI	Public Safety	2/3													
		Retaining Wall	Concrete	7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 11. Delamination	1	DI	Public Safety	2/3												
	Others		16. Other Types of Defects	1	DI	Public Safety	2/3													
	Common		17. Defects of Reinforcing material 19. Discoloration / Deterioration 23. Deformation / Break	1	DI	Public Safety	2/3													
	* Primary element		25. Settlement / Tilt / Movement 26. Scour	1	DI	Public Safety	2/3													
	Bearing Main Body Anchor Bolts		Steel (Rubber)	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 12. Abnormal Spacing 15. Function Disorder of Bearings 16. Other Types of Defects	1	DI	Public Safety	2/3												
	Common		20. Water Leakage / Puddle 21. Abnormal Noise / Vibration 23. Deformation / Break 24. Accumulation of Debris	1	DI	Public Safety	2/3													
	* Primary element		25. Settlement / Tilt / Movement 26. Crack	1	DI	Public Safety	2/3													
	Bearing Seat Mortar		Concrete	7. Spalling / Exposed Rebar 11. Delamination	1	DI	Public Safety	2/3												
	Bearing Bed concrete		Others	16. Other Types of Defects	1	DI	Public Safety	2/3												
	* Primary element		Common	20. Water Leakage / Puddle 23. Deformation / Break	1	DI	Public Safety	2/3												

Bridge Evaluation Report Form

File Number Zone	Bridge Name				Nagamachi Bridge				Superstructure				Box Culvert				Date			
	Bridge Name		Circle		Division		Type of Defects		Span No.		Sub-Division		Year		1938					
	Element Type	Material	Type of Defects	Span No.	Sub-Division	Year	1938													
Component	Element Type	Material	Type of Defects	Span No.	Sub-Division	Year	1938													
Pavement	Secondary element	Others	13. Difference in Level 14. Abnormal Bituminous Pavement 16. Other Types of Defects	1	DI	Public Safety	3/3													
		Common	24. Accumulation of Debris	1	DI	Public Safety	3/3													
		Bridge Approaches	Others	13. Difference in Level 14. Abnormal Bituminous Pavement 16. Other Types of Defects	1	DI	Public Safety	3/3												
			Common	24. Accumulation of Debris	1	DI	Public Safety	3/3												
			Expansion Joints (Rubber / Steel) > Including - elements of post-cast concrete	Steel (Rubber)	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 6. Crack 11. Delamination 12. Abnormal Spacing 13. Difference in Level 16. Other Types of Defects	1	DI	Public Safety	3/3											
				Common	20. Water Leakage / Puddle 21. Abnormal Noise / Vibration 23. Deformation / Break 24. Accumulation of Debris	1	DI	Public Safety	3/3											
				Secondary element	Steel	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 6. Crack 7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 11. Delamination 16. Other Types of Defects	1	DI	Public Safety	3/3										
					Concrete	7. Spalling / Exposed Rebar 8. Water leakage / Efflorescence 11. Delamination 16. Other Types of Defects	1	DI	Public Safety	3/3										
					Common	19. Discoloration / Deterioration 23. Deformation / Break	1	DI	Public Safety	3/3										
					Drainage System > Including - Catch-Basin - Drainage Pipe	Steel Polyvinyl	1. Corrosion 4. Fracture 5. Deterioration of Paint System 16. Other Types of Defects	1	DI	Public Safety	3/3									
	Others					19. Discoloration / Deterioration 20. Water Leakage / Puddle 23. Deformation / Break 24. Accumulation of Debris	1	DI	Public Safety	3/3										
	Lighting Facility Road Sign Facility					Steel	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 16. Other Types of Defects	1	DI	Public Safety	3/3									
		Common				19. Discoloration / Deterioration 23. Deformation / Break	1	DI	Public Safety	3/3										
		Secondary element				Steel	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 16. Other Types of Defects	1	DI	Public Safety	3/3									
			Common			19. Discoloration / Deterioration 23. Deformation / Break	1	DI	Public Safety	3/3										
			Inspection Facility Utility Pipe			Steel	1. Corrosion 2. Crack in Steel 3. Loose or Missing Bolts 4. Fracture 5. Deterioration of Paint System 16. Other Types of Defects	1	DI	Public Safety	3/3									
				Common		21. Abnormal Noise / Vibration 23. Deformation / Break	1	DI	Public Safety	3/3										
				Secondary element		Common	21. Abnormal Noise / Vibration 23. Deformation / Break	1	DI	Public Safety	3/3									

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								
	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								
	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	$T \geq 20\text{mm}$ or not
	13)	Difference in Level	a	-	c	-	e	
	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	

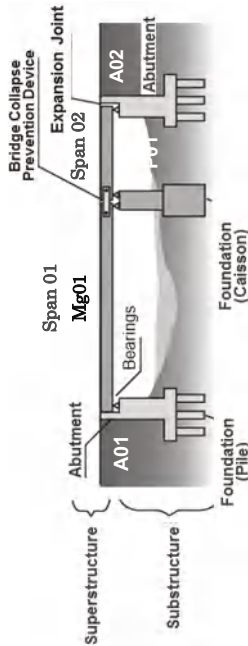
Bridge Element Numbering System

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

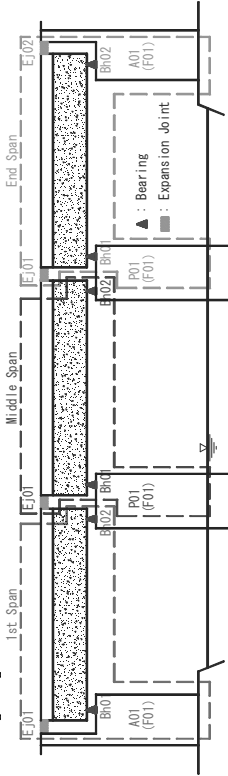
The superstructure element numbering system should include the spans, the girders, and in case of truss the panel point

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.

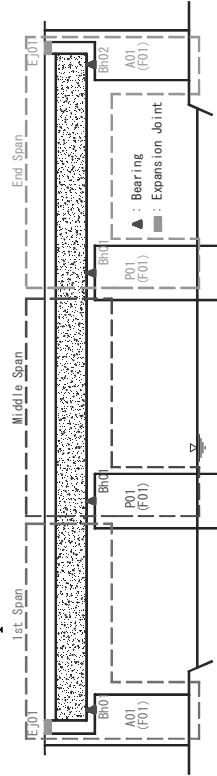


Each element of main girders and deck slab, abutment and piers, and bearings is numbered according to the following span configuration..

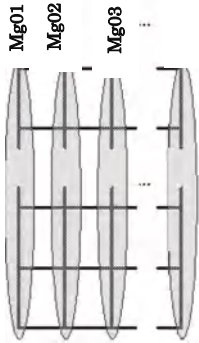
a. Simple span



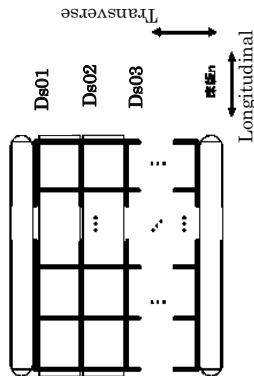
b. Continuous Span



Main Girders



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

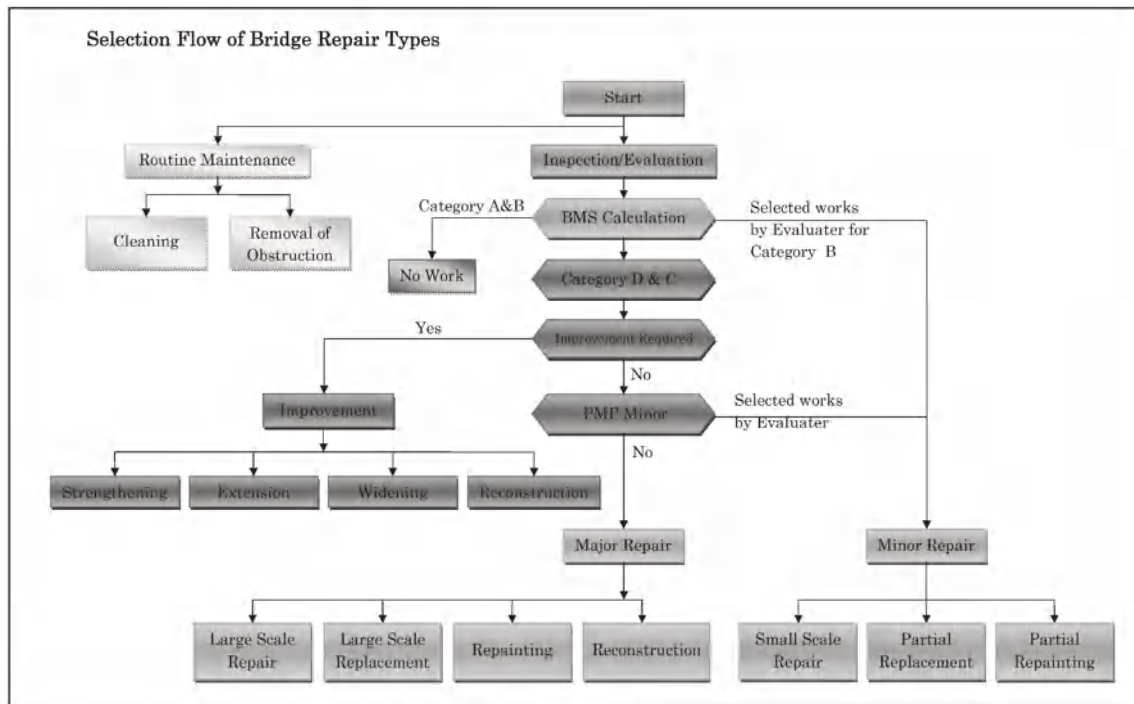


Figure 1-4 Selection Flow of Bridge repair types

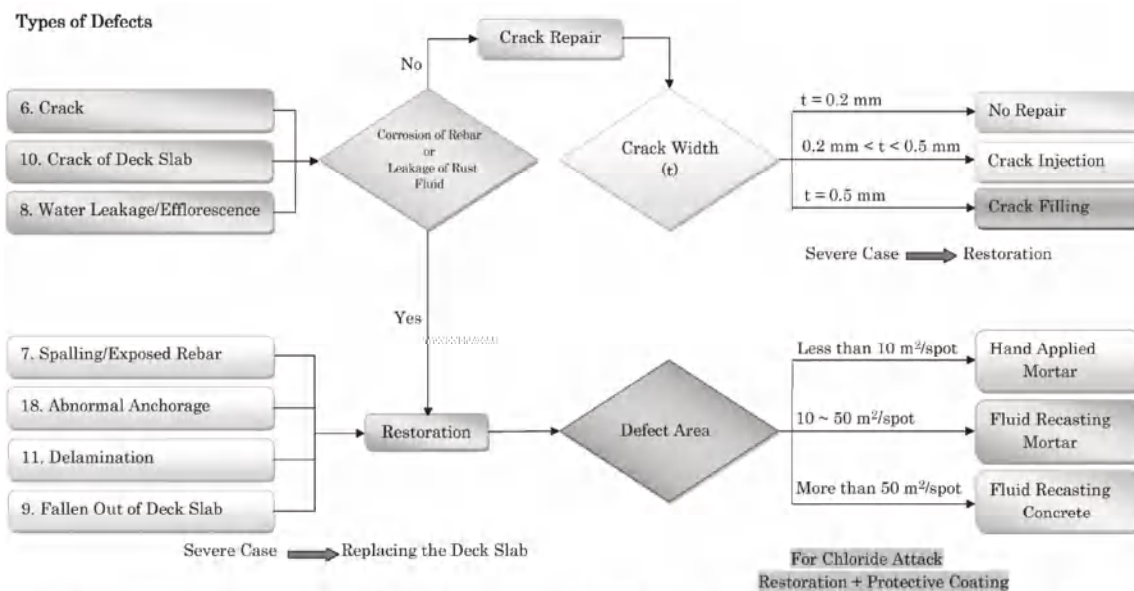


Figure 4-1 Selection Flow of Repair method of Concrete elements (Superstructure)

The Flow based by Local Government Jp

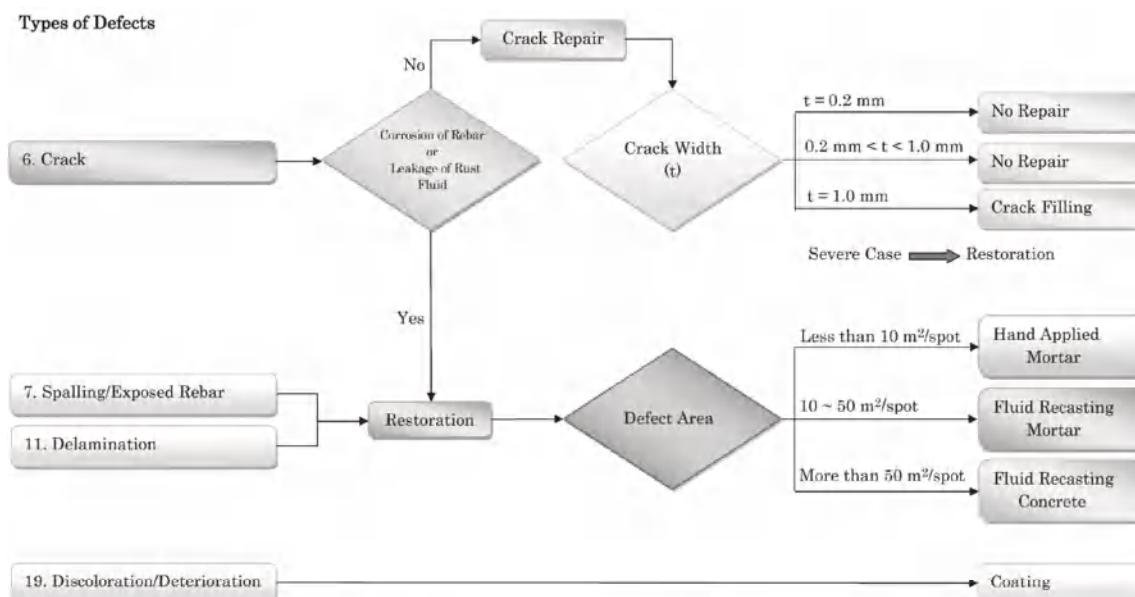


Figure 4-2 Selection Flow of Repair method of Concrete elements (Substructure)
The Flow based by Local Government Jp

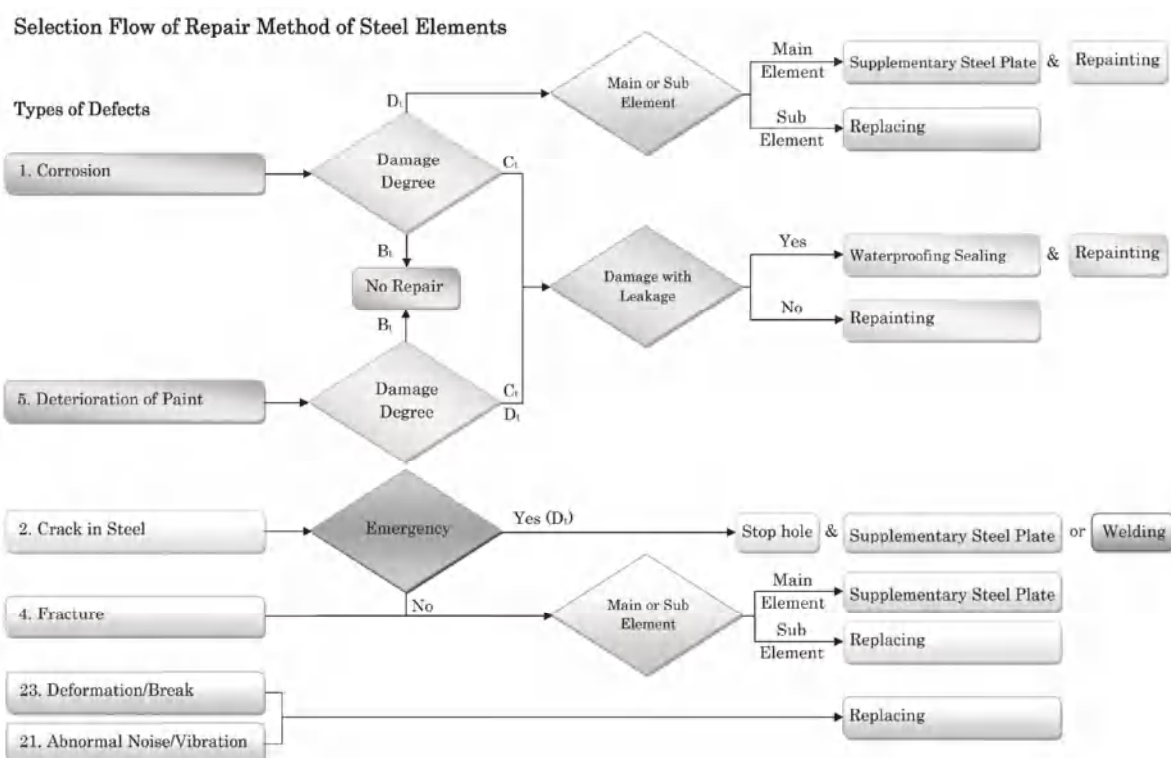


Figure 4-3 Selection Flow of Repair method of steel elements
The Flow based by Local Government Jp

Selection Flow of Repair Method of Expansion Joint

Types of Defects

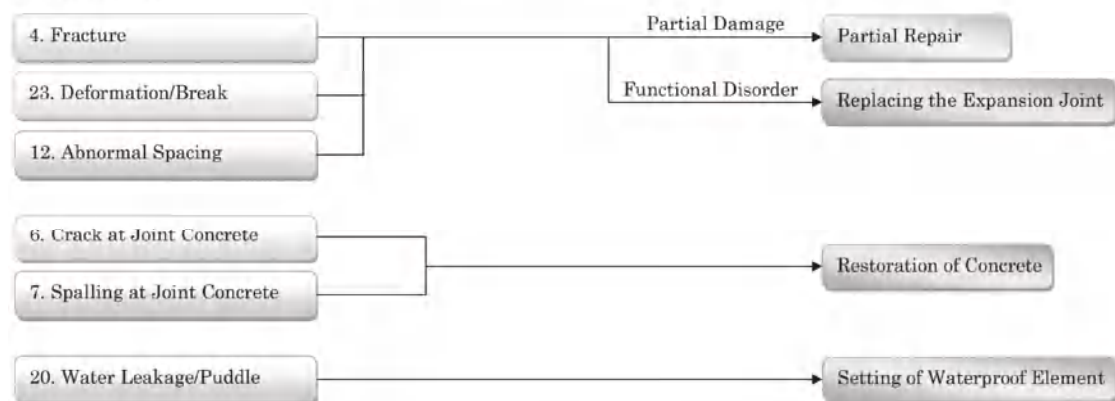


Figure 4-9 Selection Flow of Repair method of Expansion joint

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

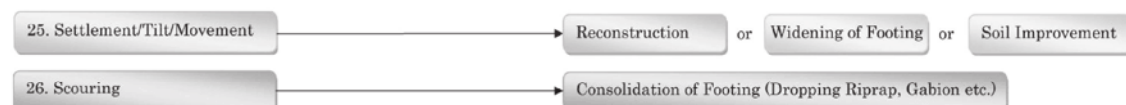


Figure 4-13 Selection Flow of Repair method of Footing

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

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-2	Suspended Scaffolding Work	Type B	m2	20,278	Cost-2
Cost-3	Suspended Scaffolding Work	Type C	m2	20,278	Cost-3
Cost-4	Prefabricated Scaffolding Work		m3	812	Cost-4
1.2 Excavation and Backfill for Structures					
Cost-11	Excavation and Backfill Work on Land		m3	473	Cost-11
Cost-12	Excavation and Backfill Work in River	Water Depth of 1 m or Less: Sandy Soil	m3	585	Cost-12
Cost-13	Excavation and Backfill Work in River	Water Depth of Over 1 m: Sandy Soil	m3	601	Cost-13
Cost-14	Excavation and Backfill Work in River	Water Depth of 1 m or Less: Soft Rock	m3	648	Cost-14
Cost-15	Excavation and Backfill Work in River	Water Depth of Over 1 m: Soft Rock	m3	661	Cost-15
2. Concrete Element					
2.1 Surface Protection Coating					
Cost-21	Surface Protection Coating		m2	2,962	Cost-21
2.2 Repairing of Crack					
Cost-22	Repairing of Crack	Crack Filling	m	89	Cost-22
Cost-23	Repairing of Crack	Crack Injection	m	5,419	Cost-23
2.3 Concrete Restruction					
Cost-24	Concrete Restruction	Hand Applied Mortar	m3	197,579	Cost-24
Cost-25	Concrete Restruction	Fluid Recasting Mortar	m3	95,793	Cost-25
Cost-26	Concrete Restruction	Fluid Recasting Concrete	m3	100,036	Cost-26
Cost-27	Concrete Restruction	Spray Applied Mortar	m3	1,938,644	Cost-27
2.4 Replacement of Curb					
Cost-28	Replacement of Curb		m3	43,930	Cost-28
2.5 CFRP Bonding on Concrete Member					
Cost-29	CFRP Bonding on Concrete Member		m2	55,422	Cost-29

Unit Price List of Cost Estimation

No.	Item	Description	Unit	Unit Price (BDT)	Remarks
3. Steel Element					
3.1 Re-painting of Steel Member					
Cost-31	Re-painting of Steel Member		m2	2,323	Cost-31
3.2 Supplementing Steel Plate					
Cost-32	Supplementing Steel Plate		m2	75,045	Cost-32
3.3 CFRP Bonding on Steel Member					
Cost-33	CFRP Bonding on Steel Member		m2	58,768	Cost-33
4. Concrete Deck					
Cost-41	Replacement of Concrete Deck	30m length, 10.2m width and deck slab of 250mm thickness	span	24,958,168	Cost-41
5. Concrete Pier					
Cost-51	Strengthening of Concrete Pier with Spray Applied Mortar	10m height, 1.8m dia meter and lining mortar of 70mm thickness	pier	4,026,677	Cost-51
6. Bearing					
Cost-61	Repairing of Bearing	0.8m x 0.8m	number	1,578	Cost-61
Cost-62	Replacement of Bearing	Rubber Bearing, 200t Type	number	96,979	Cost-62
7. Expansion Joint					
Cost-71	Repairing of Expansion Joint		m	12,612	Cost-71
Cost-72	Replacement of Expansion Joint		m	34,229	Cost-72
8. Road Surface					
Cost-81	Replacement of Asphalt Pavement without Waterproofing	30m length and 7.3m width	span	431,045	Cost-81
Cost-82	Replacement of Asphalt Pavement with Waterproofing of Liquid-Type	30m length and 7.3m width	span	1,287,629	Cost-82
Cost-83	Replacement of Asphalt Pavement with Waterproofing of Sheet-Type	30m length and 7.3m width	span	1,708,637	Cost-83

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					
Cost-92	Replacement of Railing		m	26,007	Cost-92
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

Common	Railing (steel)	BMS Defects Coefficient Setting				No. of Rule
		Defect Type	Defect Coefficient	Quantity coefficient	Defect Coefficient	
Common	Railing (steel)	1	Corrosion	0.00	0.00	102
		2	Crack in Steel	0.00	0.00	
Common	Railing (steel)	3	Loose Bolts	0.00	0.00	102
		4	Fracture	0.00	0.00	
Common	Railing (steel)	5	Deterioration of Paint	0.00	0.00	102
		16	Others	0.00	0.00	
Common	Railing (steel)	23	Deformation	0.00	0.00	102
		23	Deformation	0.00	0.00	
Common	Retaining wall	6	Crack	0.00	0.00	101
		7	Spalling / Exposed	0.00	0.00	
Common	Retaining wall	8	Water Leakage	0.00	0.00	101
		11	Delamination	0.00	0.00	
Common	Retaining wall	16	Others	0.00	0.00	101
		17	Reinforcing Material	0.00	0.00	
Common	Retaining wall	19	Discoloration of Materials	0.00	0.00	101
		23	Deformation	0.00	0.00	
Common	Retaining wall	25	Settlement	0.00	0.00	101
		26	Scouring	0.00	0.00	
Common	Road Sign	1	Corrosion	0.00	0.00	303
		2	Crack in Steel	0.00	0.00	
Common	Road Sign	3	Loose Bolts	0.00	0.00	303
		4	Fracture	0.00	0.00	
Common	Road Sign	5	Deterioration of Paint	0.00	0.00	303
		16	Others	0.00	0.00	
Common	Road Sign	19	Discoloration of Materials	0.00	0.00	303
		23	Deformation	0.00	0.00	
Common	Road Sign	23	Deformation	0.00	0.00	303
		23	Deformation	0.00	0.00	
Common	Side Wall	6	Crack	0.43	0.43	303
		7	Spalling / Exposed	0.57	0.57	
Common	Side Wall	8	Water Leakage	0.29	0.29	303
		11	Delamination	0.14	0.14	
Common	Side Wall	16	Others	0.00	0.00	303
		17	Reinforcing Material	0.57	0.57	
Common	Side Wall	19	Discoloration of Materials	0.14	0.14	303
		20	Water Leakage	0.14	0.14	
Common	Side Wall	23	Deformation	0.14	0.14	303
		23	Deformation	0.14	0.14	
Common	Utility Pipe	1	Corrosion	0.00	0.00	303
		2	Crack in Steel	0.00	0.00	
Common	Utility Pipe	3	Loose Bolts	0.00	0.00	303
		4	Fracture	0.00	0.00	
Common	Utility Pipe	5	Deterioration of Paint	0.00	0.00	303
		16	Others	0.00	0.00	
Common	Utility Pipe	19	Discoloration of Materials	0.00	0.00	303
		23	Deformation	0.00	0.00	
Common	Wheel Guard	6	Crack	0.00	0.00	303
		7	Spalling / Exposed	0.00	0.00	
Common	Wheel Guard	8	Water Leakage	0.00	0.00	303
		11	Delamination	0.00	0.00	
Common	Wheel Guard	16	Others	0.00	0.00	303
		18	Abnormal Anchorage	0.00	0.00	
Common	Wheel Guard	23	Deformation	0.00	0.00	303
		23	Deformation	0.00	0.00	

Common	Bridge Approach	BMS Defects Coefficient Setting				No. of Rule
		Defect Type	Defect Coefficient	Quantity coefficient	Defect Coefficient	
Common	Bridge Approach	13	Difference in Level	0.00	0.00	102
		14	Abnormal Pavement	0.00	0.00	
Common	Bridge Approach	16	Others	0.00	0.00	102
		24	Debris	0.00	0.00	
Common	Ourb	6	Crack	0.00	0.00	102
		7	Spalling / Exposed	0.00	0.00	
Common	Ourb	8	Water Leakage	0.00	0.00	102
		11	Delamination	0.00	0.00	
Common	Ourb	16	Others	0.00	0.00	102
		18	Abnormal Anchorage	0.00	0.00	
Common	Ourb	23	Deformation	0.00	0.00	102
		23	Deformation	0.00	0.00	
Common	Drainage System	1	Corrosion	0.00	0.00	301
		4	Fracture	0.00	0.00	
Common	Drainage System	5	Deterioration of Paint	0.00	0.00	301
		16	Others	0.00	0.00	
Common	Drainage System	19	Discoloration of Materials	0.00	0.00	301
		20	Water Leakage	0.00	0.00	
Common	Drainage System	23	Deformation	0.00	0.00	301
		24	Debris	0.00	0.00	
Common	Footing	6	Crack	0.43	0.43	301
		7	Spalling / Exposed	0.57	0.57	
Common	Footing	16	Others	0.00	0.00	301
		25	Settlement	0.25	0.25	
Common	Footing	26	Scouring	1.00	1.00	301
		26	Scouring	1.00	1.00	
Common	Head Slab	6	Crack	0.33	0.33	301
		7	Spalling / Exposed	0.67	0.67	
Common	Head Slab	8	Water Leakage	0.17	0.17	301
		11	Delamination	0.17	0.17	
Common	Head Slab	16	Others	0.00	0.00	301
		17	Reinforcing Material	0.30	0.30	
Common	Head Slab	19	Discoloration of Materials	0.03	0.03	301
		20	Water Leakage	0.14	0.14	
Common	Head Slab	21	Noise / Vibration	0.50	0.50	301
		23	Deformation	0.03	0.03	
Common	Lighting facility	1	Corrosion	0.00	0.00	301
		2	Crack in Steel	0.00	0.00	
Common	Lighting facility	3	Loose Bolts	0.00	0.00	301
		4	Fracture	0.00	0.00	
Common	Lighting facility	5	Deterioration of Paint	0.00	0.00	301
		16	Others	0.00	0.00	
Common	Lighting facility	19	Discoloration of Materials	0.00	0.00	301
		23	Deformation	0.00	0.00	
Common	Pavement	13	Difference in Level	0.00	0.00	104
		14	Abnormal Pavement	0.00	0.00	
Common	Pavement	16	Others	0.00	0.00	104
		24	Debris	0.00	0.00	
Common	Railing (concrete)	6	Crack	0.00	0.00	102
		7	Spalling / Exposed	0.00	0.00	
Common	Railing (concrete)	8	Water Leakage	0.00	0.00	102
		11	Delamination	0.00	0.00	
Common	Railing (concrete)	16	Others	0.00	0.00	102
		18	Abnormal Anchorage	0.00	0.00	
Common	Railing (concrete)	23	Deformation	0.00	0.00	102
		23	Deformation	0.00	0.00	

Bridge Type : Concrete Arch Bridge		BMS Defects Coefficient Setting					
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule	
				Qt	Dt	Qt	Dt
Common	Abutment	6	Crack	5.00	5.00	101	101
		7	Spalling / Exposed	5.00	–	101	–
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		19	Discoloration of Materials				
		20	Water Leakage				
		23	Deformation				
Common	Bearing (rubber)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	–	1.00	–	101
		3	Loose Bolts				
		4	Fracture	–	1.00	–	101
		5	Deterioration of Paint	1.00	–	101	–
		15	Disorder of Bearing	–	1.00	–	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing (steel)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	–	1.00	–	101
		3	Loose Bolts				
		4	Fracture	–	1.00	–	101
		5	Deterioration of Paint	1.00	–	101	–
		15	Disorder of Bearing	–	1.00	–	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing seat	6	Crack	–	0.25	–	101
		11	Delamination	0.25	0.25	101	101
		16	Others				
		23	Deformation	0.25	0.25	101	101
Common	Bridge Approach	13	Difference in Level				
		14	Abnormal Pavement				
		16	Others				
		24	Debris				
Concrete Girder	Cross beam	6	Crack	2.00	2.00	201	203
		7	Spalling / Exposed	0.01	–	201	–
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		18	Abnormal Anchorage				
		19	Discoloration of Materials				
		21	Noise / Vibration				
		23	Deformation				
Common	Curb	6	Crack				
		7	Spalling / Exposed				
		8	Water Leakage				
		11	Delamination				
		16	Others				
		18	Abnormal Anchorage				
		23	Deformation				

Common	Deck Slab (concrete)	7	Spalling / Exposed	0.10	–	202	–
		8	Water Leakage	0.10			
		9	Fallen out of Deck	1.00	–	–	201
		10	Crack of Deck	0.75	2.00	202	202
		11	Delamination	0.03			
		16	Others				
		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	1.00	103	103
		13	Difference in Level	0.00	1.00	103	103
		16	Others	0.00			
		20	Water Leakage	0.00	1.00	103	103
		21	Noise / Vibration	0.00			
		23	Deformation	0.00	1.00	103	103
		24	Debris	0.00			
Common	Exp. Joints (Steel)	1	Corrosion	0.00	1.00	103	103
		2	Crack in Steel	0.00			
		3	Loose Bolts	0.00			
		4	Fracture	0.00	1.00	103	103
		5	Deterioration of Paint	0.00			
		12	Abnormal Spacing	0.00			
		13	Difference in Level	0.00	1.00	103	103
		16	Others	0.00			
		20	Water Leakage	0.00			
		21	Noise / Vibration	0.00			
Common	Foundation	16	Others	0.00			
		25	Settlement	0.25	150	101	101
		26	Scouring	1.00	150	150	101
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 Arch	Main Arch	6	Crack	0.33	0.50	1.00	205	205
		7	Spalling / Exposed	0.87	0.05	-	204	-
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		12	Abnormal Spacing	0.17				
		16	Others	0.00				
		17	Reinforcing Material	0.30				
		18	Abnormal Anchorage	0.87				
		19	Discoloration of Materials	0.03	0.16	-	101	-
		21	Noise / Vibration	0.50				
		22	Abnormal Deflection	0.30				
		23	Deformation	0.03				
Arch	Parapet Wall	6	Crack	0.33				
		7	Spalling / Exposed	0.87				
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		6	Crack	0.33				
		7	Spalling / Exposed	0.87				
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		12	Abnormal Spacing	0.17				
		16	Others	0.00				
		19	Discoloration of Materials	0.03				
		21	Noise / Vibration	0.50				
		22	Abnormal Deflection	0.30				
Common	Pavement	13	Difference in Level	0.00				
		14	Abnormal Pavement	0.00	1.00	-	104	-
		16	Others	0.00				
		24	Debris	0.00				
Common	Pier	6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57	10.00	-	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				
Common	Railing (concrete)	23	Deformation	0.14				
		6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				
Common	Railing (steel)	18	Abnormal Anchorage	0.00				
		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				
Common	Retaining wall	5	Deterioration of Paint	0.00				
		16	Others	0.00				
		23	Deformation	0.00	-	1.00	-	102
		6	Crack	0.00	5.00	5.00	101	101
		7	Spalling / Exposed	0.00	5.00	-	101	-
		8	Water Leakage	0.00				
Common		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	5.00		101	
		26	Scouring	0.00	5.00	5.00	101	101

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		BMS Defects Coefficient Setting					
Element	Defect Type	Defect Coefficient		Quantity coefficient		No. of Rule	
		Qt	Dt	Qt	Dt	Qt	Dt
Common	Abutment	6	Crack	5.00	5.00	101	101
		7	Spalling / Exposed	5.00	-	101	-
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		19	Discoloration of Materials				
		20	Water Leakage				
		23	Deformation				
Masonry Arch	Arch Rib	6	Crack				
		7	Spalling / Exposed		-		-
		8	Water Leakage				
		11	Delamination				
		12	Abnormal Spacing				
		16	Others				
		17	Reinforcing Material				
		18	Abnormal Anchorage		-		-
		19	Discoloration of Materials				
		21	Noise / Vibration				
Common	Bridge Approach	22	Abnormal Deflection				
		23	Deformation				
		13	Difference in Level				
		14	Abnormal Pavement				
		16	Others				
		24	Debris				
Common	Curb	6	Crack				
		7	Spalling / Exposed				
		8	Water Leakage				
		11	Delamination				
		16	Others				
		18	Abnormal Anchorage				
		23	Deformation				
Common	Drainage System	1	Corrosion				
		4	Fracture				
		5	Deterioration of Paint				
		16	Others				
		19	Discoloration of Materials				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Foundation	16	Others				
		25	Settlement	150	150	101	101
		26	Scouring	150	150	101	101
Common	Lighting facility	1	Corrosion				
		2	Crack in Steel				
		3	Loose Bolts				
		4	Fracture				
		5	Deterioration of Paint				
		16	Others				
		19	Discoloration of Materials				
		23	Deformation				
		6	Crack				
		7	Spalling / Exposed				
		8	Water Leakage				
		11	Delamination				

Arch	Parapet Wall	6	Crack	0.33			
		7	Spalling / Exposed	0.67			
		8	Water Leakage	0.17			
		11	Delamination	0.17			
		12	Abnormal Spacing	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	Pavement	13	Difference in Level	0.00			
		14	Abnormal Pavement	0.00	1.00	-	104
		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
Common	Railing (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			
		16	Others	0.00			
		23	Deformation	0.00			
Common	Retaining wall	6	Crack	0.00	5.00	5.00	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	5.00		101
		26	Scouring	0.00	5.00	5.00	101
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 : PC Box Girder Bridge		(same as RC Box Girder Bridge)		BMS Defects Coefficient Setting			
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule	
				Qt	Dt	Qt	Dt
Common	Abutment	6	Crack	5.00	5.00	101	101
		7	Spalling / Exposed	5.00	-	101	-
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		19	Discoloration of Materials				
		20	Water Leakage				
		23	Deformation				
Common	Bearing (rubber)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	-	1.00	-	101
		3	Loose Bolts				
		4	Fracture	-	1.00	-	101
		5	Deterioration of Paint	1.00	-	101	-
		15	Disorder of Bearing	-	1.00	-	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing (steel)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	-	1.00	-	101
		3	Loose Bolts				
		4	Fracture	-	1.00	-	101
		5	Deterioration of Paint	1.00	-	101	-
		15	Disorder of Bearing	-	1.00	-	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing seat	6	Crack	-	0.25	-	101
		11	Delamination	0.25	0.25	101	101
		16	Others				
		23	Deformation	0.25	0.25	101	101
Common	Bridge Approach	13	Difference in Level				
		14	Abnormal Pavement				
		16	Others				
		24	Debris				
Concrete Girder	Cross beam	6	Crack	2.00	2.00	201	203
		7	Spalling / Exposed	0.01	-	201	-
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		18	Abnormal Anchorage				
		19	Discoloration of Materials				
		21	Noise / Vibration				
		23	Deformation				
Common	Curb	6	Crack				
		7	Spalling / Exposed				
		8	Water Leakage				
		11	Delamination				
		16	Others				
		18	Abnormal Anchorage				
		23	Deformation				

Common	Deck Slab (concrete)	7	Spalling / Exposed	0.10	0.05	-	202	-
		8	Water Leakage	0.10				
		9	Fallen out of Deck	1.00	-	1.00	-	201
		10	Crack of Deck	0.75	2.00	1.00	202	202
		11	Delamination	0.03				
		16	Others					
		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	1.00	1.00	103	103
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00	1.00	1.00	103	103
		21	Noise / Vibration	0.00				
		23	Deformation	0.00	1.00	1.00	103	103
		24	Debris	0.00				
Common	Exp. Joints (Steel)	1	Corrosion	0.00	1.00	1.00	103	103
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00	1.00	1.00	103	103
		5	Deterioration of Paint	0.00				
		12	Abnormal Spacing	0.00				
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00				
		21	Noise / Vibration	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	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				

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			
Common	Wheel Guard	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			
Common	Wheel Guard	16	Others	0.00			
		18	Abnormal Anchorage	0.00			
		23	Deformation	0.00			

Concrete Box	Main Girder	6	Crack	0.33	0.50	1.00	205	205
		7	Spalling / Exposed	0.87	0.05	-	204	-
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		12	Abnormal Spacing	0.17				
		16	Others	0.00				
		17	Reinforcing Material	0.30				
		18	Abnormal Anchorage	0.87				
		19	Discoloration of Materials	0.03				
		21	Noise / Vibration	0.50				
		22	Abnormal Deflection	0.30				
		23	Deformation	0.03				

Common	Pavement	6	Crack	0.33				
		7	Spalling / Exposed	0.87				
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		13	Difference in Level	0.00				
		14	Abnormal Pavement	0.00				
		16	Others	0.00				
		24	Debris	0.00				
		6	Crack	0.33				
		7	Spalling / Exposed	0.87				
		8	Water Leakage	0.17				
		11	Delamination	0.17				

Common	Pier	6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57	10.00	-	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				
		6	Crack	0.43				
		7	Spalling / Exposed	0.57				
		8	Water Leakage	0.29				

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				
		6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				

Common	Railing (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				
		16	Others	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				

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	5.00		101	
		26	Scouring	0.00	5.00	5.00	101	101
		6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	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				
		6	Crack	0.00				
		7	Spalling / Exposed	0.00				
		8	Water Leakage	0.00				
		11	Delamination	0.00				
		16	Others	0.00				

Bridge Type : PC Girder Bridge		(same as RC Girder Bridge)		BMS Defects Coefficient Setting			
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule	
				Qt	Dt	Qt	Dt
Common	Abutment	6	Crack	5.00	5.00	101	101
		7	Spalling / Exposed	5.00	-	101	-
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		19	Discoloration of Materials				
		20	Water Leakage				
		23	Deformation				
Common	Bearing (rubber)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	-	1.00	-	101
		3	Loose Bolts				
		4	Fracture	-	1.00	-	101
		5	Deterioration of Paint	1.00	-	101	-
		15	Disorder of Bearing	-	1.00	-	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing (steel)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	-	1.00	-	101
		3	Loose Bolts				
		4	Fracture	-	1.00	-	101
		5	Deterioration of Paint	1.00	-	101	-
		15	Disorder of Bearing	-	1.00	-	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing seat	6	Crack	-	0.25	-	101
		11	Delamination	0.25	0.25	101	101
		16	Others				
		23	Deformation	0.25	0.25	101	101
Common	Bridge Approach	13	Difference in Level				
		14	Abnormal Pavement				
		16	Others				
		24	Debris				
Concrete Girder	Cross beam	6	Crack	2.00	2.00	201	203
		7	Spalling / Exposed	0.01	-	201	-
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		18	Abnormal Anchorage				
		19	Discoloration of Materials				
		21	Noise / Vibration				
		23	Deformation				
Common	Curb	6	Crack				
		7	Spalling / Exposed				
		8	Water Leakage				
		11	Delamination				
		16	Others				
		18	Abnormal Anchorage				
		23	Deformation				

Common	Deck Slab (concrete)	7	Spalling / Exposed	0.10	0.05	-	202	-
		8	Water Leakage	0.10				
		9	Fallen out of Deck	1.00	-	1.00	-	201
		10	Crack of Deck	0.75	2.00	1.00	202	202
		11	Delamination	0.03				
		16	Others					
		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	1.00	1.00	103	103
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00	1.00	1.00	103	103
		21	Noise / Vibration	0.00				
		23	Deformation	0.00	1.00	1.00	103	103
		24	Debris	0.00				
Common	Exp. Joints (Steel)	1	Corrosion	0.00	1.00	1.00	103	103
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00	1.00	1.00	103	103
		5	Deterioration of Paint	0.00				
		12	Abnormal Spacing	0.00				
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00				
		21	Noise / Vibration	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	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	6	Crack	0.33	2.00	1.00	205	205				
		7	Spalling / Exposed	0.87	0.05	-	204	-				
		8	Water Leakage	0.17								
		11	Delamination	0.17								
		12	Abnormal Spacing	0.17								
		16	Others	0.00								
		17	Reinforcing Material	0.30								
		18	Abnormal Anchorage	0.87	0.16	-	101	-				
		19	Discoloration of Materials	0.03								
		21	Noise / Vibration	0.50								
		22	Abnormal Deflection	0.30								
		23	Deformation	0.03								
		Common	Pavement	15	Disorder of Bearing	0.75	1.00	1.00	101	101		
				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	1.00	101	101		
				13	Difference in Level	0.00						
14	Abnormal Pavement			0.00	1.00	-	104	-				
16	Others			0.00								
24	Debris			0.00								
Common	Pier			6	Crack	0.43	10.00	10.00	101	101		
				7	Spalling / Exposed	0.57	10.00	-	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	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		
				Common	Railing (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						
16	Others					0.00						
23	Deformation					0.00	-	1.00	-	102		
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	5.00	5.00	101	101		
		26	Scouring			0.00	5.00	5.00	101	101		
		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	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						
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 : Portable Steel Bridge		BMS Defects Coefficient Setting					
Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule		
			Qt	Dt	Qt	Dt	
Common	Abutment	6	Crack				
		7	Spalling / Exposed	0.43			
		8	Water Leakage	0.29			
		11	Delamination	0.14			
		16	Others	0.00			
		17	Reinforcing Material	0.37			
		19	Discoloring of Materials	0.14			
		20	Water Leakage	0.14			
		23	Deformation	0.14			
		25	Settlement	0.88			
Common	Bearing (rubber)	1	Corrosion	0.25	1.00	101	101
		2	Crack in Steel	1.00			
		3	Loose Bolts	0.50			
		4	Fracture	1.00			
		5	Deterioration of Paint	0.25	1.00		
		15	Disorder of Bearing	1.00			
		16	Others	0.00			
		20	Water Leakage	0.25			
		23	Deformation	0.13			
		24	Debris	0.13			
Common	Bearing (steel)	1	Corrosion	0.25	1.00	101	101
		2	Crack in Steel	1.00			
		3	Loose Bolts	0.50			
		4	Fracture	1.00			
		5	Deterioration of Paint	0.25	1.00		
		15	Disorder of Bearing	0.75			
		16	Others	0.00			
		20	Water Leakage	0.25			
		23	Deformation	0.25			
		24	Debris	0.25			
Common	Bearing seat	6	Crack	0.14			
		11	Delamination	0.29			
		16	Others	0.00			
		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			
		25	Settlement	0.50			
Portable Steel Truss Steel Arch	Cross beam	1	Corrosion	0.33	3.00	101	101
		2	Crack in Steel	1.00	1.00	101	101
		3	Loose Bolts	0.17			
		4	Fracture	1.00			
		5	Deterioration of Paint	0.17			
		16	Others	0.00			
		21	Noise / Vibration	0.33			
		23	Deformation	0.17			
		25	Settlement	0.88			
		26	Debris	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			
		25	Settlement	0.88			
		26	Debris	0.17			
		27	Others	0.00			

Common	Deck Slab (steel)	1 Corrosion	0.50	1.50	1.50	201	201
		2 Crack in Steel	1.00	1.00	1.00	201	201
		3 Loose Bolts	0.17				
		4 Fracture	1.00	–	1.00	–	201
		5 Deterioration of Paint	0.17	1.00	–	202	–
		16 Others	0.00				
		21 Noise / Vibration	0.17				
		23 Deformation	0.17				
		25 Settlement					
		26 Debris					
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				
		25 Settlement					
		26 Debris					
Common	Exp. Joints (rubber)	12 Abnormal Spacing	0.00	1.00	1.00	103	103
		13 Difference in Level	0.00	1.00	1.00	103	103
		16 Others	0.00				
		20 Water Leakage	0.00	1.00	1.00	103	103
		21 Noise / Vibration	0.00				
		23 Deformation	0.00	1.00	1.00	103	103
		24 Debris	0.00				
		25 Settlement					
		26 Debris					
		27 Others					
Common	Exp. Joints (Steel)	1 Corrosion	0.00	1.00	1.00	103	103
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00	1.00	1.00	103	103
		5 Deterioration of Paint	0.00				
		12 Abnormal Spacing	0.00				
		13 Difference in Level	0.00	1.00	1.00	103	103
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
Common	Foundation	16 Others	0.00				
		25 Settlement	0.25	150	150	101	101
		26 Scouring	1.00	150	150	101	101
		27 Others					
Portable Steel Truss Steel Arch	Lateral Bracing	1 Corrosion	0.00	3.00	3.00	201	201
		2 Crack in Steel	0.00	1.00	1.00	101	101
		3 Loose Bolts	0.00				
		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				
		25 Settlement					
		26 Debris					
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				
		25 Settlement					
		26 Debris					
Common	Disorder of Bearing	15 Disorder of Bearing	0.75	1.00	1.00	101	101
		6 Crack	0.33				
		7 Spalling / Exposed	0.87				
		8 Water Leakage	0.17				
		11 Delamination	0.17				
		15 Disorder of Bearing	0.75				
		16 Others					
		17 Reinforcing Material					
		19 Discoloration of Materials					
		20 Water Leakage					

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				
Common	Wheel Guard	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				

Portable Steel Truss	Main Truss	1	Corrosion	0.80	3.00	3.00	101	101
		2	Crack in Steel	1.00	1.00	1.00	101	101
		3	Loose Bolts	0.20				
		4	Fracture	1.00	1.00			
		5	Deterioration of Paint	0.20			208	
		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				
Common	Pavement	13	Difference in Level	0.00				
		14	Abnormal Pavement	0.00	1.00		104	
		16	Others	0.00				
		24	Debris	0.00				

Common	Pier	6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57	10.00		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	Railing (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				
		16	Others	0.00				
		23	Deformation	0.00				

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	5.00		101	
		26	Scouring	0.00	5.00	5.00	101	101

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				

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				
		16	Others	0.00	0.70		102	
		17	Reinforcing Material	0.00				
		21	Noise / Vibration	0.00				
		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			
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule	
				Qt	Dt	Qt	Dt
Common	Abutment	6	Crack	5.00	5.00	101	101
		7	Spalling / Exposed	5.00	–	101	–
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		19	Discoloration of Materials				
		20	Water Leakage				
		23	Deformation				
Common	Bearing (rubber)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	–	1.00	–	101
		3	Loose Bolts				
		4	Fracture	–	1.00	–	101
		5	Deterioration of Paint	1.00	–	101	–
		15	Disorder of Bearing	–	1.00	–	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing (steel)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	–	1.00	–	101
		3	Loose Bolts				
		4	Fracture	–	1.00	–	101
		5	Deterioration of Paint	1.00	–	101	–
		15	Disorder of Bearing	–	1.00	–	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing seat	6	Crack	–	0.25	–	101
		11	Delamination	0.25	0.25	101	101
		16	Others				
		23	Deformation	0.25	0.25	101	101
Common	Bridge Approach	13	Difference in Level				
		14	Abnormal Pavement				
		16	Others				
		24	Debris				
Concrete Girder	Cross beam	6	Crack	2.00	2.00	201	203
		7	Spalling / Exposed	0.01	–	201	–
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		18	Abnormal Anchorage				
		19	Discoloration of Materials				
		21	Noise / Vibration				
		23	Deformation				
Common	Curb	6	Crack				
		7	Spalling / Exposed				
		8	Water Leakage				
		11	Delamination				
		16	Others				
		18	Abnormal Anchorage				
		23	Deformation				

Common	Deck Slab (concrete)	7	Spalling / Exposed	0.10	–	202	–
		8	Water Leakage	0.10			
		9	Fallen out of Deck	1.00	–	–	201
		10	Crack of Deck	0.75	1.00	202	202
		11	Delamination	0.03			
		16	Others				
		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	1.00	103	103
		13	Difference in Level	0.00	1.00	103	103
		16	Others	0.00			
		20	Water Leakage	0.00	1.00	103	103
		21	Noise / Vibration	0.00			
		23	Deformation	0.00	1.00	103	103
		24	Debris	0.00			
Common	Exp. Joints (Steel)	1	Corrosion	0.00	1.00	103	103
		2	Crack in Steel	0.00			
		3	Loose Bolts	0.00			
		4	Fracture	0.00	1.00	103	103
		5	Deterioration of Paint	0.00			
		12	Abnormal Spacing	0.00			
		13	Difference in Level	0.00	1.00	103	103
		16	Others	0.00			
		20	Water Leakage	0.00			
		21	Noise / Vibration	0.00			
Common	Foundation	16	Others	0.00			
		25	Settlement	0.25	150	101	101
		26	Scouring	1.00	150	150	101
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 Box	Main Girder	6	Crack	0.33	0.50	1.00	205	205
		7	Spalling / Exposed	0.87	0.05	-	204	-
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		12	Abnormal Spacing	0.17				
		16	Others	0.00				
		17	Reinforcing Material	0.30				
		18	Abnormal Anchorage	0.87				
		19	Discoloration of Materials	0.83				
		21	Noise / Vibration	0.50				
		22	Abnormal Deflection	0.30				
		23	Deformation	0.03				
		15	Disorder of Bearing	0.75				
		6	Crack	0.33				
		7	Spalling / Exposed	0.87				
		8	Water Leakage	0.17				
		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	Pier	6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57	10.00	-	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				
		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
		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				
		25	Settlement	0.00	5.00		101	
		26	Scouring	0.00	5.00	5.00	101	101
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	5.00		101	
		26	Scouring	0.00	5.00	5.00	101	101
		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				
Common		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 : RC Girder Bridge		(same as PG Girder Bridge)		BMS Defects Coefficient Setting			
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule	
				Qt	Dt	Qt	Dt
Common	Abutment	6	Crack	5.00	5.00	101	101
		7	Spalling / Exposed	5.00	-	101	-
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		19	Discoloration of Materials				
		20	Water Leakage				
		23	Deformation				
Common	Bearing (rubber)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	-	1.00	-	101
		3	Loose Bolts				
		4	Fracture	-	1.00	-	101
		5	Deterioration of Paint	1.00	-	101	-
		15	Disorder of Bearing	-	1.00	-	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing (steel)	1	Corrosion	1.00	1.00	101	101
		2	Crack in Steel	-	1.00	-	101
		3	Loose Bolts				
		4	Fracture	-	1.00	-	101
		5	Deterioration of Paint	1.00	-	101	-
		15	Disorder of Bearing	-	1.00	-	101
		16	Others				
		20	Water Leakage				
		23	Deformation				
		24	Debris				
Common	Bearing seat	6	Crack	-	0.25	-	101
		11	Delamination	0.25	0.25	101	101
		16	Others				
		23	Deformation	0.25	0.25	101	101
Common	Bridge Approach	13	Difference in Level				
		14	Abnormal Pavement				
		16	Others				
		24	Debris				
Concrete Girder	Cross beam	6	Crack	2.00	2.00	201	203
		7	Spalling / Exposed	0.01	-	201	-
		8	Water Leakage				
		11	Delamination				
		16	Others				
		17	Reinforcing Material				
		18	Abnormal Anchorage				
		19	Discoloration of Materials				
		21	Noise / Vibration				
		23	Deformation				
Common	Curb	6	Crack				
		7	Spalling / Exposed				
		8	Water Leakage				
		11	Delamination				
		16	Others				
		18	Abnormal Anchorage				
		23	Deformation				

Common	Deck Slab (concrete)	7	Spalling / Exposed	0.10	0.05	-	202	-
		8	Water Leakage	0.10				
		9	Fallen out of Deck	1.00	-	1.00	-	201
		10	Crack of Deck	0.75	2.00	1.00	202	202
		11	Delamination	0.03				
		16	Others					
		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	1.00	1.00	103	103
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00	1.00	1.00	103	103
		21	Noise / Vibration	0.00				
		23	Deformation	0.00	1.00	1.00	103	103
		24	Debris	0.00				
Common	Exp. Joints (Steel)	1	Corrosion	0.00	1.00	1.00	103	103
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00	1.00	1.00	103	103
		5	Deterioration of Paint	0.00				
		12	Abnormal Spacing	0.00				
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00				
		21	Noise / Vibration	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	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	6	Crack	0.33	2.00	1.00	205	205
		7	Spalling / Exposed	0.87	0.05	-	204	-
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		12	Abnormal Spacing	0.17				
		16	Others	0.00				
		17	Reinforcing Material	0.30				
		18	Abnormal Anchorage	0.87				
		19	Discoloration of Materials	0.83				
		21	Noise / Vibration	0.50				
		22	Abnormal Deflection	0.30				
		23	Deformation	0.03				
Common	Pavement	15	Disorder of Bearing	0.75	1.00	1.00	101	101
		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	1.00	101	101
		13	Difference in Level	0.00				
		14	Abnormal Pavement	0.00	1.00	-	104	-
		16	Others	0.00				
		24	Debris	0.00				
Common	Pier	6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57	10.00	-	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	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	-	1.00	-	102
		23	Deformation	0.00				
Common	Railing (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				
		16	Others	0.00				
		23	Deformation	0.00	-	1.00	-	102
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	5.00		101	
		26	Scouring	0.00	5.00	5.00	101	101
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 : Rigid Frame Bridge			BMS Defects Coefficient Setting					
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule		
				Qt	Dt	Qt	Dt	
Common	Abutment	6	Crack					
		7	Spalling / Exposed	5.00	5.00	101	101	
		8	Water Leakage					
		11	Delamination					
		16	Others					
		17	Reinforcing Material					
		19	Discoloration of Materials					
		20	Water Leakage					
		23	Deformation					
Common	Bearing (rubber)	1	Corrosion	1.00	1.00	101	101	
		2	Crack in Steel	-	1.00	-	101	
		3	Loose Bolts					
		4	Fracture	-	1.00	-	101	
		5	Deterioration of Paint	1.00	-	101	-	
		15	Disorder of Bearing	-	1.00	-	101	
		16	Others					
		20	Water Leakage					
		23	Deformation					
		24	Debris					
Common	Bearing (steel)	1	Corrosion	1.00	1.00	101	101	
		2	Crack in Steel	-	1.00	-	101	
		3	Loose Bolts					
		4	Fracture	-	1.00	-	101	
		5	Deterioration of Paint	1.00	-	101	-	
		15	Disorder of Bearing	-	1.00	-	101	
		16	Others					
		20	Water Leakage					
		23	Deformation					
		24	Debris					
Common	Basing seat	6	Crack	-	0.25	-	101	
		11	Delamination	0.25	0.25	101	101	
		16	Others					
		23	Deformation	0.25	0.25	101	101	
Common	Bridge Approach	13	Difference in Level					
		14	Abnormal Pavement					
		16	Others					
		24	Debris					
Concrete Girder	Cross beam	6	Crack	2.00	2.00	201	203	
		7	Spalling / Exposed	0.01	-	201	-	
		8	Water Leakage					
		11	Delamination					
		16	Others					
		17	Reinforcing Material					
		18	Abnormal Anchorage					
		19	Discoloration of Materials					
		21	Noise / Vibration					
		23	Deformation					
Common	Curb	6	Crack					
		7	Spalling / Exposed					
		8	Water Leakage					
		11	Delamination					
		16	Others					
		18	Abnormal Anchorage					
		23	Deformation					

Common	Deck Slab (concrete)	7	Spalling / Exposed	0.10	0.05	-	202	-
		8	Water Leakage	0.10				
		9	Fallen out of Deck	1.00	-	1.00	-	201
		10	Crack of Deck	0.75	2.00	1.00	202	202
		11	Delamination	0.03				
		16	Others					
		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	1.00	1.00	103	103
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00	1.00	1.00	103	103
		21	Noise / Vibration	0.00				
		23	Deformation	0.00	1.00	1.00	103	103
		24	Debris	0.00				
Common	Exp. Joints (Steel)	1	Corrosion	0.00	1.00	1.00	103	103
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00	1.00	1.00	103	103
		5	Deterioration of Paint	0.00				
		12	Abnormal Spacing	0.00				
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00				
		21	Noise / Vibration	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	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	6	Crack	0.33	2.00	1.00	205	205
		7	Spalling / Exposed	0.87	0.05	-	204	-
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		12	Abnormal Spacing	0.17				
		16	Others	0.00				
		17	Reinforcing Material	0.30				
		18	Abnormal Anchorage	0.87	0.16	-	101	-
		19	Discoloration of Materials	0.03				
		21	Noise / Vibration	0.50				
		22	Abnormal Deflection	0.30				
		23	Deformation	0.03				
Common	Pavement	15	Disorder of Bearing	0.75	1.00	1.00	101	101
		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	1.00	101	101
		13	Difference in Level	0.00				
		14	Abnormal Pavement	0.00	1.00	-	104	-
		16	Others	0.00				
		24	Debris	0.00				
Common	Pier	6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57	10.00	-	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	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	-	1.00	-	102
		23	Deformation	0.00				
Common	Railing (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				
		16	Others	0.00	-	1.00	-	102
		23	Deformation	0.00				
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	5.00		101	
		26	Scouring	0.00	5.00	5.00	101	101
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 : Small Slab Bridge			BMS Defects Coefficient Setting							
Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule					
			Qt	Dt	Qt	Dt				
Common	Abutment	6	Crack		0.43					
		7	Spalling / Exposed		0.37			101	101	
		8	Water Leakage		0.29		5.00	5.00	-	
		11	Delamination		0.14					
		16	Others		0.00					
		17	Reinforcing Material		0.37					
		19	Discoloration of Materials		0.14					
		20	Water Leakage		0.14					
		23	Deformation		0.14					
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		0.05	-	202	-
		8	Water Leakage		0.10					
		9	Fallen out of Deck		1.00		-	1.00	-	201
		10	Crack of Deck		0.75		2.00	1.00	202	202
		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		1.00	1.00	103	103
		13	Difference in Level		0.00		1.00	1.00	103	103
		16	Others		0.00					
		20	Water Leakage		0.00		1.00	1.00	103	103
		21	Noise / Vibration		0.00					
		23	Deformation		0.00		1.00	1.00	103	103
		24	Debris		0.00					

Common	Exp. Joints (Steel)	1	Corrosion	0.00	1.00	1.00	103	103
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
		4	Fracture	0.00	1.00	1.00	103	103
		5	Deterioration of Paint	0.00				
		12	Abnormal Spacing	0.00				
		13	Difference in Level	0.00	1.00	1.00	103	103
		16	Others	0.00				
		20	Water Leakage	0.00				
		21	Noise / Vibration	0.00				
Common	Foundation	23	Deformation	0.00	1.00	1.00	103	103
		24	Debris	0.00				
Common	Inspection Facility	16	Others	0.00				
		25	Settlement	0.25	150	150	101	101
		26	Scouring	1.00	150	150	101	101
		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	19	Discoloration of Materials	0.00				
		23	Deformation	0.00				
Concrete Girder	Main Girder	6	Crack	0.33	2.00	1.00	205	205
		7	Spalling / Exposed	0.87	0.05	–	204	–
		8	Water Leakage	0.17				
		11	Delamination	0.17				
		12	Abnormal Spacing	0.17				
		16	Others	0.00				
		17	Reinforcing Material	0.30				
		18	Abnormal Anchorage	0.87	0.18	–	101	–
		19	Discoloration of Materials	0.03				
		21	Noise / Vibration	0.50				
Common	Pavement	22	Abnormal Deflection	0.30				
		23	Deformation	0.03				
		15	Disorder of Bearing	0.75	1.00	1.00	101	101
		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	1.00	101	101
		13	Difference in Level	0.00				
Common	Pier	14	Abnormal Pavement	0.00	1.00	–	104	–
		16	Others	0.00				
Common	Pier	6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57	10.00	–	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	Railing (concrete)	6	Crack	0.00					
		7	Spalling / Exposed	0.00					
		8	Water Leakage	0.00					
		11	Delamination	0.00					
		16	Others	0.00					
		23	Abnormal Anchorage	0.00					
Common	Railing (steel)	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					
Common	Retaining wall	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	6	Crack	0.00	5.00	5.00		101	101
		7	Spalling / Exposed	0.00	5.00	5.00		101	101
		8	Water Leakage	0.00					
		11	Delamination	0.00					
		16	Others	0.00					
		17	Reinforcing Material	0.00					
Common	Utility Pipe	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					
Common	Wheel Guard	5	Deterioration of Paint	0.00					
		16	Others	0.00					
		19	Discoloration of Materials	0.00					
		23	Deformation	0.00					
		6	Crack	0.00					
		7	Spalling / Exposed	0.00					
Common	Wheel Guard	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					

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

Common	Deck Slab (steel)	1 Corrosion	0.50	1.50	1.50	201	201	201	201	201	201
		2 Crack in Steel	1.00	1.00	1.00	201	201	201	201	201	201
		3 Loose Bolts	0.17								
		4 Fracture	1.00	–	1.00	–	201	–	201	–	201
		5 Deterioration of Paint	0.17	1.00	–	202	–	–	–	–	–
		16 Others	0.00								
		21 Noise / Vibration	0.17								
		23 Deformation	0.17								
		7 Spalling / Exposed	0.10	0.05	–	202	–	–	–	–	–
		8 Water Leakage	0.10								
Common	Deck Slab (concrete)	9 Fallen out of Deck	1.00	–	1.00	–	201	–	201	–	201
		10 Crack of Deck	0.75	2.00	1.00	202	202	202	202	202	202
		11 Delamination	0.03								
		16 Others	0.00								
		17 Reinforcing Material	0.25								
		18 Abnormal Anchorage	0.25								
		19 Discoloration of Materials	0.03								
		1 Corrosion	0.00								
		4 Fracture	0.00								
		5 Deterioration of Paint	0.00								
Common	Drainage System	16 Others	0.00								
		19 Discoloration of Materials	0.00								
		20 Water Leakage	0.00								
		23 Deformation	0.00								
		24 Debris	0.00								
		12 Abnormal Spacing	0.00	1.00	1.00	103	103	103	103	103	103
		13 Difference in Level	0.00	1.00	1.00	103	103	103	103	103	103
		16 Others	0.00								
		20 Water Leakage	0.00	1.00	1.00	103	103	103	103	103	103
		21 Noise / Vibration	0.00	1.00	1.00	103	103	103	103	103	103
Common	Exp. Joints (Rubber)	23 Deformation	0.00	1.00	1.00	103	103	103	103	103	103
		24 Debris	0.00								
		1 Corrosion	0.00	1.00	1.00	103	103	103	103	103	103
		2 Crack in Steel	0.00								
		3 Loose Bolts	0.00								
		4 Fracture	0.00	1.00	1.00	103	103	103	103	103	103
		5 Deterioration of Paint	0.00								
		12 Abnormal Spacing	0.00								
		13 Difference in Level	0.00	1.00	1.00	103	103	103	103	103	103
		16 Others	0.00								
Common	Exp. Joints (Steel)	20 Water Leakage	0.00								
		21 Noise / Vibration	0.00								
		23 Deformation	0.00	1.00	1.00	103	103	103	103	103	103
		24 Debris	0.00								
		16 Others	0.00								
		25 Settlement	0.25	150	150	101	101	101	101	101	101
		26 Scouring	1.00	150	150	101	101	101	101	101	101
		16 Others	0.00								
		25 Settlement	0.25								
		26 Scouring	1.00								
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								
		24 Debris	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								
		24 Debris	0.00								

Common	Retaining wall	6	Crack	0.00	5.00	5.00	101	101
		7	Spalling / Exposed	0.00	5.00	5.00	101	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				
Common	Road Sign	25	Settlement	0.00	5.00	5.00	101	101
		26	Scouring	0.00	5.00	5.00	101	101
		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				
Portable Steel Truss Steel Arch	Stringer	19	Discoloration of Materials	0.00				
		23	Deformation	0.00				
		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				
		16	Others	0.00				
Common	Utility Pipe	17	Reinforcing Material	0.00				
		21	Noise / Vibration	0.00				
		22	Abnormal Deflection	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				
Common	Wheel Guard	5	Deterioration of Paint	0.00				
		16	Others	0.00				
		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				

Steel	Lateral Bracing	1	Corrosion	0.00	3.00	3.00	201	201
		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				
		16	Others	0.00				
		17	Reinforcing Material	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				
Steel Arch	Main Arch	1	Corrosion	0.80	3.00	3.00	209	209
		2	Crack in Steel	1.00	1.00	1.00	101	101
		3	Loose Bolts	0.20				
		4	Fracture	1.00				
		5	Deterioration of Paint	0.20				
		12	Abnormal Spacing	0.20				
		16	Others	0.00				
		17	Reinforcing Material	0.20				
Common	Pavement	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
		6	Crack	0.33				
		7	Spalling / Exposed	0.87				
		8	Water Leakage	0.17				
Common	Pier	11	Delamination	0.17				
		15	Disorder of Bearing	0.75	1.00	1.00	101	101
		13	Difference in Level	0.00				
		14	Abnormal Pavement	0.00				
		16	Others	0.00				
		24	Debris	0.00				
		6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57				
Common	Railing (concrete)	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				
		6	Crack	0.00				
Common	Railing (steel)	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	Corrosion	0.00				
		2	Crack in Steel	0.00				
Common	Railing (steel)	3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
		23	Deformation	0.00				
		1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
Common	Railing (steel)	4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	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				

Bridge Type : Steel Box Girder Bridge		BMS Defects Coefficient Setting					
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule	
				Qt	Dt	Qt	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	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				
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	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				
Common	Bealing seat	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				
		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				
Steel Girder	Cross beam	1 Corrosion	0.33	1.50	1.50	203	203
		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	1.50	-	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				

Common	Deck Slab (steel)	1 Corrosion	0.50	1.50	1.50	201	201
		2 Crack in Steel	1.00	1.00	1.00	201	201
		3 Loose Bolts	0.17				
		4 Fracture	1.00	-	1.00	-	201
		5 Deterioration of Paint	0.17	1.00	-	202	-
		16 Others	0.00				
		21 Noise / Vibration	0.17				
		23 Deformation	0.17				
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10	0.05	-	202	-
		8 Water Leakage	0.10				
		9 Fallen out of Deck	1.00	-	1.00	-	201
		10 Crack of Deck	0.75	2.00	1.00	202	202
		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				
		Discoloration of Materials	0.00				
		19 Water Leakage	0.00				
		23 Deformation	0.00				
		24 Debris	0.00				
Common	Exp. Joints (Rubber)	12 Abnormal Spacing	0.00	1.00	1.00	103	103
		13 Difference in Level	0.00	1.00	1.00	103	103
		16 Others	0.00				
		20 Water Leakage	0.00	1.00	1.00	103	103
		21 Noise / Vibration	0.00				
		23 Deformation	0.00	1.00	1.00	103	103
		24 Debris	0.00				
Common	Exp. Joints (Steel)	1 Corrosion	0.00	1.00	1.00	103	103
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00	1.00	1.00	103	103
		5 Deterioration of Paint	0.00				
		12 Abnormal Spacing	0.00				
		13 Difference in Level	0.00	1.00	1.00	103	103
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	0.00				
Common	Foundation	23 Deformation	0.00	1.00	1.00	103	103
		24 Debris	0.00				
Common	Inspection Facility	16 Others	0.00				
		25 Settlement	0.25	150	150	101	101
		26 Scouring	1.00	150	150	101	101

Common	Retaining wall	6	Crack	0.00	5.00	5.00	101	101
		7	Spalling / Exposed	0.00	5.00	5.00	101	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				
Common	Road Sign	25	Settlement	0.00	5.00	5.00	101	101
		26	Scouring	0.00	5.00	5.00	101	101
		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				
Steel Girder	Stringer	19	Discoloration of Materials	0.00				
		23	Deformation	0.00				
		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				
		16	Others	0.00				
Common	Utility Pipe	17	Reinforcing Material	0.00				
		21	Noise / Vibration	0.00				
		22	Abnormal Deflection	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				
Common	Wheel Guard	5	Deterioration of Paint	0.00				
		16	Others	0.00				
		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				

Steel	Lateral Bracing	1	Corrosion	0.00	3.00	3.00	201	201
		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				
		16	Others	0.00				
		17	Reinforcing Material	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				
Steel Box	Main Girder	1	Corrosion	0.80	3.00	3.00	209	209
		2	Crack in Steel	1.00	1.00	1.00	101	101
		3	Loose Bolts	0.20				
		4	Fracture	1.00				
		5	Deterioration of Paint	0.20				
		12	Abnormal Spacing	0.20				
		16	Others	0.00				
		17	Reinforcing Material	0.20				
Common	Pavement	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
		6	Crack	0.33				
		7	Spalling / Exposed	0.87				
		8	Water Leakage	0.17				
Common	Pier	11	Delamination	0.17				
		15	Disorder of Bearing	0.75	1.00	1.00	101	101
		13	Difference in Level	0.00				
		14	Abnormal Pavement	0.00				
		16	Others	0.00				
		24	Debris	0.00				
		6	Crack	0.43	10.00	10.00	101	101
		7	Spalling / Exposed	0.57				
Common	Railing (concrete)	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				
		6	Crack	0.00				
Common	Railing (steel)	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	Corrosion	0.00				
		2	Crack in Steel	0.00				
Common	Railing (steel)	3	Loose Bolts	0.00				
		4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	0.00				
		23	Deformation	0.00				
		1	Corrosion	0.00				
		2	Crack in Steel	0.00				
		3	Loose Bolts	0.00				
Common	Railing (steel)	4	Fracture	0.00				
		5	Deterioration of Paint	0.00				
		16	Others	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				

Bridge Type : Steel Girder Bridge			BMS Defects Coefficient Setting						
Common	Element	Defect Type	Defect Coefficient	Quantity coefficient		No. of Rule			
				Qt	Dt	Qt	Dt		
Common	Abutment	6	Crack		5.00	5.00	101	101	
		7	Spalling / Exposed	0.43					
		8	Water Leakage	0.29		5.00	–	101	–
		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	–	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					
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	–	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	Bealing 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					
Steel Girder	Cross beam	1	Corrosion	0.33	1.50	1.50	203	203	
		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	1.50	–	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					

Common	Deck Slab (steel)	1 Corrosion	0.50	1.50	1.50	201	201
		2 Crack in Steel	1.00	1.00	1.00	201	201
		3 Loose Bolts	0.17				
		4 Fracture	1.00	–	1.00	–	201
		5 Deterioration of Paint	0.17	1.00	–	202	–
		16 Others	0.00				
		21 Noise / Vibration	0.17				
		23 Deformation	0.17				
Common	Deck Slab (concrete)	7 Spalling / Exposed	0.10	0.05	–	202	–
		8 Water Leakage	0.10				
		9 Fallen out of Deck	1.00	–	1.00	–	201
		10 Crack of Deck	0.75	2.00	1.00	202	202
		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				
		Discoloration of Materials	0.00				
		19 Water Leakage	0.00				
		23 Deformation	0.00				
		24 Debris	0.00				
Common	Exp. Joints (Rubber)	12 Abnormal Spacing	0.00	1.00	1.00	103	103
		13 Difference in Level	0.00	1.00	1.00	103	103
		16 Others	0.00				
		20 Water Leakage	0.00	1.00	1.00	103	103
		21 Noise / Vibration	0.00				
		23 Deformation	0.00	1.00	1.00	103	103
		24 Debris	0.00				
Common	Exp. Joints (Steel)	1 Corrosion	0.00	1.00	1.00	103	103
		2 Crack in Steel	0.00				
		3 Loose Bolts	0.00				
		4 Fracture	0.00	1.00	1.00	103	103
		5 Deterioration of Paint	0.00				
		12 Abnormal Spacing	0.00				
		13 Difference in Level	0.00	1.00	1.00	103	103
		16 Others	0.00				
		20 Water Leakage	0.00				
		21 Noise / Vibration	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	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				

[illegible]

Steel	Lateral Bracing	1 Corrosion	0.00	3.00	3.00	201	201
		2 Crack in Steel	0.00	1.00	1.00	101	101
		3 Loose Bolts	0.00				
		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				
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				
Steel Girder	Main Girder	1 Corrosion	0.60	3.00	3.00	209	209
		2 Crack in Steel	1.00	1.00	1.00	101	101
		3 Loose Bolts	0.20				
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.20	1.00	-	207	-
		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				
Steel	Main Girder Hinge	1 Corrosion	0.60	1.00	1.00	101	101
		2 Crack in Steel	1.00				
		3 Loose Bolts	0.20				
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.20				
		12 Abnormal Spacing	0.20				
		15 Disorder of Bearing	0.75	1.00	1.00	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	1 Corrosion	0.60	1.00	1.00	101	101
		2 Crack in Steel	1.00				
		3 Loose Bolts	0.20				
		4 Fracture	1.00	-	1.00	-	101
		5 Deterioration of Paint	0.20				
		6 Crack	0.33				
		7 Spalling / Exposed	0.67				
		8 Water Leakage	0.17				
		11 Delamination	0.17				
		12 Abnormal Spacing	0.20				
		15 Disorder of Bearing	0.75	1.00	1.00	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				
Common	Pavement	13 Difference in Level	0.00				
		14 Abnormal Pavement	0.00	1.00	-	104	-
		16 Others	0.00				
		24 Debris	0.00				
Common	Pier	6 Crack	0.43	10.00	10.00	101	101

Bridge Type : Truss 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	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	-	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						
25	Settlement	0.50						
Common	Bealing 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	-	1.00	-	101
		4	Fracture	1.00	1.40	-	201	-
		5	Deterioration of Paint	0.17				
		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				

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	5.00		101			
		26	Scouring	0.00	5.00	5.00	101	101		
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						
		17	Reinforcing Material	0.00						
		19	Discoloration of Materials	0.00						
		23	Deformation	0.00						
		Steel Girder	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	—	1.00	—	101		
5	Deterioration of Paint			0.00	0.70	—	102	—		
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						
		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						

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	1.50 1.00 1.00 1.00 1.00 1.00 1.00	201 201 201 201 202 201 201	201 201 201 201 202 201 201	Portable Steel Truss Steel Arch	Lateral Bracing	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 17 Reinforcing Material 0.00 23 Deformation 0.00	3.00 1.00 1.00 1.00 0.40 1.00 1.00	201 101 101 101 102 101 101
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	0.05 1.00 2.00 1.00 1.00 1.00 1.00	202 202 202 202 202 202 202	202 201 202 202 202 202 202	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	1.00 1.00 1.00 1.00 1.00 1.00 1.00	101 101 101 101 101 101 101
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	1.00 1.00 1.00 1.00 1.00 1.00 1.00	103 103 103 103 103 103 103	103 103 103 103 103 103 103	Portable Steel Truss	Main Truss	15 Disorder of Bearing 0.75 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 Corrosion 0.00 2 Crack in Steel 1.00 3 Loose Bolts 0.20 4 Fracture 1.00 5 Deterioration of Paint 0.20 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	1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	101 101 101 101 101 101 101 101 101 101 101 101 101 101 101 101
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	1.00 1.00 1.00 1.00 1.00 1.00 1.00	103 103 103 103 103 103 103	103 103 103 103 103 103 103	Common	Pavement	13 Difference in Level 0.00 14 Abnormal Pavement 0.00 16 Others 0.00 24 Debris 0.00	1.00 1.00 1.00 1.00	104 104 104 104
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	1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	103 103 103 103 103 103 103 103 103 103 103 103	103 103 103 103 103 103 103 103 103 103 103 103	Common	Pier	6 Crack 0.43 7 Spalling / Exposed 0.57 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	10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00	101 101 101 101 101 101 101 101 101
Common	Foundation	16 Others 0.00 25 Settlement 0.25 26 Scouring 1.00	150 150 150	101 101 101	101 101 101	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 1.00 1.00 1.00 1.00 1.00 1.00	102 102 102 102 102 102 102
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	1.00 1.00 1.00 1.00 1.00 1.00 1.00	101 101 101 101 101 101 101	101 101 101 101 101 101 101	Common	Railing (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 16 Others 0.00 23 Deformation 0.00	1.00 1.00 1.00 1.00 1.00 1.00 1.00	102 102 102 102 102 102 102

Common	Retaining wall	6	Crack	0.00	5.00	5.00	101	101
		7	Spalling / Exposed	0.00	5.00	5.00	101	101
		8	Water Leakage	0.00	5.00	5.00	101	101
		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	5.00	5.00	101	101
		26	Scouring	0.00	5.00	5.00	101	101
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				
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	1.00	1.00	101	101
		5	Deterioration of Paint	0.00	0.70	0.70	102	102
		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				
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				

SL	Remedial Measure	Unit	Unit Cost
1	Supplementing Steel Plate	BDT/ m2	75,045
2	Repainting of Steel Member	BDT/ m2	2,323
3	Stop hole+Supplementing Steel Plate	BDT/ m2	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/ m3	197,579
8	Fluid Recasting Mortar	BDT/ m3	95,793
9	Fluid Recasting Concrete	BDT/ m3	100,036
10	Replacing the Deck Slab	BDT/ m2	24,958,168
11	Carbon Fiber Sheet Bonding on Concrete	BDT/ m2	55,422
12	Repairing of Settlement	BDT/ m3	13,465
13	Reparing of Scouling	BDT/ m3	13,461
14	Reparing of Foundation Consolodation	BDT/ m3	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/ m2	5,880
20	Replacement of Railing	BDT/ m	26,007
21	Replacement of Curb	BDT/ m3	43,930
22	Replacement of Drainage System	BDT/ pt	5,565
23	Scaffoldings for Bridge Rehabilitation / Strengthening	BDT/ m2	20,278

Component	Element Type	Material	Type of Defects	CI	DI
Superstructure	Main Girder	Steel	1. Corrosion	11 : Repainting of Steel Member	14 : Replacement of Steel Member
			2. Crack in Steel	12 : Stop hole+Supplementing Steel M : PMP Minor Repair Method	12 : Stop hole+Supplementing Steel M : PMP Minor Repair Method
			3. Loose or Missing Bolts	14 : Replacement of Steel Member	14 : Replacement of Steel Member
			4. Fracture	11 : Repainting of Steel Member	- : This category is not exist.
			5. Deterioration of Paint System	11 : Repainting of Steel Member	- : This category is not exist.
	Main Truss	Others	16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			17. Defects of Reinforcing material	X : Impossible to Fix a Method	- : This category is not exist.
			21. Abnormal Noise / Vibration	0 : No Remedy	0 : No Remedy
			23. Deformation / Break	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			23. Deformation / Break	11 : Repainting of Steel Member	10 : Supplementing Steel Plate
Substructure	Deck Slab	Steel	1. Corrosion	11 : Repainting of Steel Member	12 : Stop hole+Supplementing Steel M : PMP Minor Repair Method
			2. Crack in Steel	12 : Stop hole+Supplementing Steel M : PMP Minor Repair Method	12 : Stop hole+Supplementing Steel M : PMP Minor Repair Method
			3. Loose or Missing Bolts	X : Impossible to Fix a Method	10 : Supplementing Steel Plate
			4. Fracture	11 : Repainting of Steel Member	- : This category is not exist.
			5. Deterioration of Paint System	25 : Fluid Recasting Concrete	- : This category is not exist.
	Cross Beam	Concrete	7. Spalling / Exposed Rebar	0 : No Remedy	- : This category is not exist.
			8. Water leakage / Efflorescence	- : This category is not exist.	26 : Replacement of Concrete Deck
			9. Fallen out of Deck Slab	21 : Crack Injection	27 : Carbon Fiber Sheet Bonding on Concrete
			10. Crack of Deck Slab	- : This category is not exist.	- : This category is not exist.
			11. Delamination	X : Impossible to Fix a Method	X : Impossible to Fix a Method
Other	Cross Beam	Others	16. Other Types of Defects	X : Impossible to Fix a Method	- : This category is not exist.
			17. Defects of Reinforcing material	0 : No Remedy	- : This category is not exist.
			18. Abnormal Anchorage	- : This category is not exist.	- : This category is not exist.
			19. Discoloration / Deterioration	0 : No Remedy	- : This category is not exist.
			20. Water Leakage / Puddle	X : Impossible to Fix a Method	X : Impossible to Fix a Method
	Sillinger	Common	23. Deformation / Break	11 : Repainting of Steel Member	10 : Supplementing Steel Plate
			23. Deformation / Break	11 : Repainting of Steel Member	10 : Supplementing Steel Plate
			23. Deformation / Break	11 : Repainting of Steel Member	10 : Supplementing Steel Plate
			23. Deformation / Break	11 : Repainting of Steel Member	10 : Supplementing Steel Plate
			23. Deformation / Break	11 : Repainting of Steel Member	10 : Supplementing Steel Plate

Component	Element Type	Material	Type of Defects	CI	DI
Superstructure	Main Girder	Steel	1. Corrosion	11 : Repainting of Steel Member	10 : Supplementing Steel Plate
			2. Crack in Steel	12 : Stop hole+Supplementing Steel M : PMP Minor Repair Method	12 : Stop hole+Supplementing Steel M : PMP Minor Repair Method
			3. Loose or Missing Bolts	14 : Replacement of Steel Member	14 : Replacement of Steel Member
			4. Fracture	11 : Repainting of Steel Member	- : This category is not exist.
			5. Deterioration of Paint System	11 : Repainting of Steel Member	- : This category is not exist.
	Main Truss	Concrete	6. Crack	22 : Crack Filling	27 : Carbon Fiber Sheet Bonding on Concrete
			7. Spalling / Exposed Rebar	24 : Fluid Recasting Mortar	- : This category is not exist.
			8. Water leakage / Efflorescence	0 : No Remedy	0 : No Remedy
			11. Delamination	- : This category is not exist.	- : This category is not exist.
			12. Abnormal Spacing	0 : No Remedy	- : This category is not exist.
Substructure	Deck Slab	Others	16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			17. Defects of Reinforcing material	X : Impossible to Fix a Method	- : This category is not exist.
			18. Abnormal Anchorage	23 : Hand Applied Mortar	- : This category is not exist.
			19. Discoloration / Deterioration	- : This category is not exist.	- : This category is not exist.
			20. Water Leakage / Puddle	0 : No Remedy	- : This category is not exist.
	Cross Beam	Common	21. Abnormal Noise / Vibration	0 : No Remedy	0 : No Remedy
			22. Abnormal Deflection	0 : No Remedy	0 : No Remedy
			23. Deformation / Break	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			23. Deformation / Break	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			23. Deformation / Break	X : Impossible to Fix a Method	X : Impossible to Fix a Method
Other	Cross Beam	Concrete	7. Spalling / Exposed Rebar	24 : Fluid Recasting Mortar	- : This category is not exist.
			8. Water leakage / Efflorescence	0 : No Remedy	0 : No Remedy
			11. Delamination	- : This category is not exist.	- : This category is not exist.
			16. Other Types of Defects	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			17. Defects of Reinforcing material	X : Impossible to Fix a Method	- : This category is not exist.
	Sillinger	Common	18. Abnormal Anchorage	0 : No Remedy	- : This category is not exist.
			19. Discoloration / Deterioration	- : This category is not exist.	- : This category is not exist.
			21. Abnormal Noise / Vibration	0 : No Remedy	0 : No Remedy
			22. Abnormal Deflection	0 : No Remedy	0 : No Remedy
			23. Deformation / Break	X : Impossible to Fix a Method	X : Impossible to Fix a Method

Component	Element Type	Material	Type of Defects	C1 Major Repair	DI Emergency 10 : Supplementing Steel Plate
			1. Corrosion	0 : No Remedy	12 : Stop hole+Supplementing Steel
			2. Crack in Steel	M : PMP Minor Repair Method	M : PMP Minor Repair Method
			3. Loose or Missing Bolts	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			4. Fracture	11 : Repairing of Steel Member	22 : Crack Filling
			5. Deterioration of Paint System	21 : Crack Injection	23 : Hand Applied Mortar
			6. Crack	0 : No Remedy	0 : No Remedy
			7. Spalling / Exposed Rebar	0 : No Remedy	0 : No Remedy
			8. Water leakage / Efflorescence	0 : No Remedy	0 : No Remedy
			11. Delamination	0 : No Remedy	0 : No Remedy
			16. Other Types of Defects	0 : No Remedy	0 : No Remedy
			17. Defects of Reinforcing material	0 : No Remedy	0 : No Remedy
			19. Discoloration / Deterioration	0 : No Remedy	0 : No Remedy
			20. Water Leakage / Puddle	0 : No Remedy	0 : No Remedy
			22. Abnormal Deflection	0 : No Remedy	0 : No Remedy
			23. Deformation / Break	0 : No Remedy	0 : No Remedy
			1. Corrosion	0 : No Remedy	0 : No Remedy
			2. Crack in Steel	0 : No Remedy	0 : No Remedy
			5. Deterioration of Paint System	0 : No Remedy	0 : No Remedy
			6. Crack	0 : No Remedy	0 : No Remedy
			7. Spalling / Exposed Rebar	0 : No Remedy	0 : No Remedy
			11. Delamination	0 : No Remedy	0 : No Remedy
			16. Other Types of Defects	0 : No Remedy	0 : No Remedy
			17. Defects of Reinforcing material	0 : No Remedy	0 : No Remedy
			23. Deformation / Break	0 : No Remedy	0 : No Remedy
			25. Settlement / Tilt / Movement	0 : No Remedy	0 : No Remedy
			26. Scouring	0 : No Remedy	0 : No Remedy

Component	Element Type	Material	Type of Defects	C1 Major Repair	DI Emergency 10 : Supplementing Steel Plate
			1. Corrosion	0 : No Remedy	12 : Stop hole+Supplementing Steel
			2. Crack in Steel	M : PMP Minor Repair Method	M : PMP Minor Repair Method
			3. Loose or Missing Bolts	X : Impossible to Fix a Method	X : Impossible to Fix a Method
			4. Fracture	11 : Repairing of Steel Member	22 : Crack Filling
			5. Deterioration of Paint System	21 : Crack Injection	23 : Hand Applied Mortar
			6. Crack	0 : No Remedy	0 : No Remedy
			7. Spalling / Exposed Rebar	0 : No Remedy	0 : No Remedy
			8. Water leakage / Efflorescence	0 : No Remedy	0 : No Remedy
			11. Delamination	0 : No Remedy	0 : No Remedy
			16. Other Types of Defects	0 : No Remedy	0 : No Remedy
			17. Defects of Reinforcing material	0 : No Remedy	0 : No Remedy
			19. Discoloration / Deterioration	0 : No Remedy	0 : No Remedy
			20. Water Leakage / Puddle	0 : No Remedy	0 : No Remedy
			22. Abnormal Deflection	0 : No Remedy	0 : No Remedy
			23. Deformation / Break	0 : No Remedy	0 : No Remedy
			1. Corrosion	0 : No Remedy	0 : No Remedy
			2. Crack in Steel	0 : No Remedy	0 : No Remedy
			5. Deterioration of Paint System	0 : No Remedy	0 : No Remedy
			6. Crack	0 : No Remedy	0 : No Remedy
			7. Spalling / Exposed Rebar	0 : No Remedy	0 : No Remedy
			11. Delamination	0 : No Remedy	0 : No Remedy
			16. Other Types of Defects	0 : No Remedy	0 : No Remedy
			17. Defects of Reinforcing material	0 : No Remedy	0 : No Remedy
			23. Deformation / Break	0 : No Remedy	0 : No Remedy
			25. Settlement / Tilt / Movement	0 : No Remedy	0 : No Remedy
			26. Scouring	0 : No Remedy	0 : No Remedy

Element Type	Material	Type of Defects	CI	DI	Emergency	Method	Remedy Measure
Pavement > including Backside Approach - Secondary member - Secondary member	Others	13. Difference in Level	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	1. Corrosion
	Others	14. Abnormal Bituminous Pavement	61 : Replacement of Asphalt Pavement (& Waterproofing) X : Impossible to Fix a Method	- : This category is not exist. X : Impossible to Fix a Method	- : This category is not exist. X : Impossible to Fix a Method	- : This category is not exist. X : Impossible to Fix a Method	2. Crack in Steel
	Common	16. Other Types of Defects	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	3. Loose or Missing Bolts
	Common	24. Accumulation of Debris	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	4. Fracture
	Common	1. Corrosion	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	5. Deterioration of Paint System
Expansion Joints (Rubber / Steel) > Including - elements of post-cast concrete	Steel (Rubber)	2. Crack in Steel	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	16. Other Types of Defects
	Steel (Rubber)	3. Loose or Missing Bolts	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	19. Discoloration / Deterioration
	Steel (Rubber)	4. Fracture	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	23. Deformation / Break
	Concrete	5. Deterioration of Paint System	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	Common
	Concrete	6. Crack	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	Others
Retaining Wall > Including - Guard Fence - Wheel Guard - Median - Curb	Others	11. Delamination	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	21. Abnormal Noise / Vibration
	Others	12. Abnormal Spacing	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	22. Abnormal Deflection
	Others	13. Difference in Level	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	23. Deformation / Break
	Others	16. Other Types of Defects	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	Common
	Common	19. Discoloration / Deterioration	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	Others
Secondary member	Common	20. Water Leakage / Puddle	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	6. Crack
	Common	21. Abnormal Noise / Vibration	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	7. Spalling / Exposed Rebar
	Common	23. Deformation / Break	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	8. Water leakage / Efflorescence
	Common	24. Accumulation of Debris	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	11. Delamination
	Common	1. Corrosion	11 : Repairing of Steel Member 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	16. Other Types of Defects
Secondary member	Steel	2. Crack in Steel	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	17. Defects of Reinforcing material
	Steel	3. Loose or Missing Bolts	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	19. Discoloration / Deterioration
	Steel	4. Fracture	11 : Repairing of Steel Member 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	22. Deformation / Break
	Concrete	5. Deterioration of Paint System	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	25. Settlement / Tilt / Movement
	Concrete	6. Crack	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	26. Scour
Secondary member	Concrete	7. Spalling / Exposed Rebar	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	31 : Repairing of Settlement
	Concrete	8. Water leakage / Efflorescence	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	32 : Repairing of Scouring
	Others	11. Delamination	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	32 : Repairing of Scouring
	Others	16. Other Types of Defects	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	32 : Repairing of Scouring
	Common	17. Defects of Reinforcing material	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	32 : Repairing of Scouring

Element Type	Material	Type of Defects	CI	DI	Emergency	Method	Remedy Measure
Pavement > including Backside Approach - Secondary member - Secondary member	Others	13. Difference in Level	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	1. Corrosion
	Others	14. Abnormal Bituminous Pavement	61 : Replacement of Asphalt Pavement (& Waterproofing) X : Impossible to Fix a Method	- : This category is not exist. X : Impossible to Fix a Method	- : This category is not exist. X : Impossible to Fix a Method	- : This category is not exist. X : Impossible to Fix a Method	19. Discoloration / Deterioration
	Common	16. Other Types of Defects	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	23. Deformation / Break
	Common	24. Accumulation of Debris	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	Common
	Common	1. Corrosion	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	Others
Expansion Joints (Rubber / Steel) > Including - elements of post-cast concrete	Steel (Rubber)	2. Crack in Steel	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	21. Abnormal Noise / Vibration
	Steel (Rubber)	3. Loose or Missing Bolts	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	22. Abnormal Deflection
	Steel (Rubber)	4. Fracture	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	23. Deformation / Break
	Concrete	5. Deterioration of Paint System	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	Common
	Concrete	6. Crack	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	Others
Secondary member	Others	11. Delamination	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	6. Crack
	Others	12. Abnormal Spacing	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	7. Spalling / Exposed Rebar
	Others	13. Difference in Level	51 : Repairing of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	52 : Replacement of Expansion Joint 0 : No Remedy	8. Water leakage / Efflorescence
	Others	16. Other Types of Defects	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	11. Delamination
	Common	19. Discoloration / Deterioration	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	16. Other Types of Defects
Secondary member	Common	20. Water Leakage / Puddle	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	17. Defects of Reinforcing material
	Common	21. Abnormal Noise / Vibration	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	19. Discoloration / Deterioration
	Common	23. Deformation / Break	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	22. Deformation / Break
	Common	24. Accumulation of Debris	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	25. Settlement / Tilt / Movement
	Common	1. Corrosion	11 : Repairing of Steel Member 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	26. Scour
Secondary member	Steel	2. Crack in Steel	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	M : PMP Minor Repair Method	31 : Repairing of Settlement
	Steel	3. Loose or Missing Bolts	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	32 : Repairing of Scouring
	Steel	4. Fracture	11 : Repairing of Steel Member 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	62 : Replacement of Railing 0 : No Remedy	32 : Repairing of Scouring
	Concrete	5. Deterioration of Paint System	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	32 : Repairing of Scouring
	Concrete	6. Crack	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	32 : Repairing of Scouring
Secondary member	Concrete	7. Spalling / Exposed Rebar	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	32 : Repairing of Scouring
	Concrete	8. Water leakage / Efflorescence	0 : No Remedy	0 : No Remedy	0 : No Remedy	0 : No Remedy	32 : Repairing of Scouring
	Others	11. Delamination	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	32 : Repairing of Scouring
	Others	16. Other Types of Defects	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	32 : Repairing of Scouring
	Common	17. Defects of Reinforcing material	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	- : This category is not exist.	32 : Repairing of Scouring

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	SD	-
District	Manikganj	Upazila	-	Union	-	Village	-		
Road No.	R504	Road Name	Hemayetpur-Singar-Manikganj			LRP Name	D09a	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	-
Bridge Length	25.40 (m)	No. of Spans	1	Span Arrangement	25.4	Skew Angle	-		
Superstructure	Bridge Type	RC Girder Bridge	Concrete	Deck Slab	-	Material	-		
Substructure	Abutment	RC	-	Foundation (Abutment)	Piled foundations	-	-		
	Pier	-	-	Foundation (Pier)	Piled foundations	-	-		
Other Elements	Pavement	Asphalt	-	Base	-	-	-		
	Expansion Joint	-	-	Railing	-	-	-		
Width	Total Width	9.52 (m)	Curb-L	Sidewalk-L	Carriage way-L	Median	Carriage way-R	Sidewalk-R	Curb-R
	Effective Width	7.30 (m)	-	1.11 (m)	-	-	-	1.11 (m)	-
Traffic Conditions	Census (Year)	-	Traffic Volume			1,000 to 5,000 Vehicles		Condition Category for Entire Bridge	A
General View									
Aynal Bridge									
									
Aynal Bridge									
									
Aynal Bridge									

fig. Bridge Inventory

[illegible]

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 own data (GPS) 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	BMS Information	All bridge	☐ BMS ☐ Measured ☐ Impossible to measure
2	Position of Bridge (Front, Side, Under?)	All bridge	☐ Measured ☐ Impossible to measure
3	Bridge Length	All bridge	☐ GPS ☐ Measured ☐ Impossible to measure
4	Number of Span	All bridge	☐ GPS ☐ Measured ☐ Impossible to measure
5	Span length (each span)	All bridge	☐ BMS ☐ Measured ☐ Impossible to measure
6	Width of Bridge surface	All bridge	☐ Yes ☐ No
7	Number of Hinge (each span)	Girder Bridge	☐ Yes ☐ No

2. Under the bridge

1	Can you enter under the bridge?	All bridge	☐ Measured ☐ Impossible to measure
2	Number of Main girder	Girder Bridge	☐ GPS ☐ Measured ☐ Impossible to measure
3	Number of Cross beam (each span)	Girder Bridge	☐ Measured ☐ Impossible to measure
4	Number of Bearing	Girder Bridge	☐ Measured ☐ Impossible to measure
5	Number of Lateral Bracing	Steel Bridge	☐ Measured ☐ Impossible to measure
6	Number of Stringer	Steel Bridge	☐ Measured ☐ Impossible to measure
7	Height of Main girder	Girder Bridge	☐ Measured ☐ Impossible to measure
8	Width of Main girder	Girder Bridge	☐ Measured ☐ Impossible to measure
9	Interval of Main girders	Girder Bridge	☐ Measured ☐ Impossible to measure
10	Height of Side wall	Culvert	☐ 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.

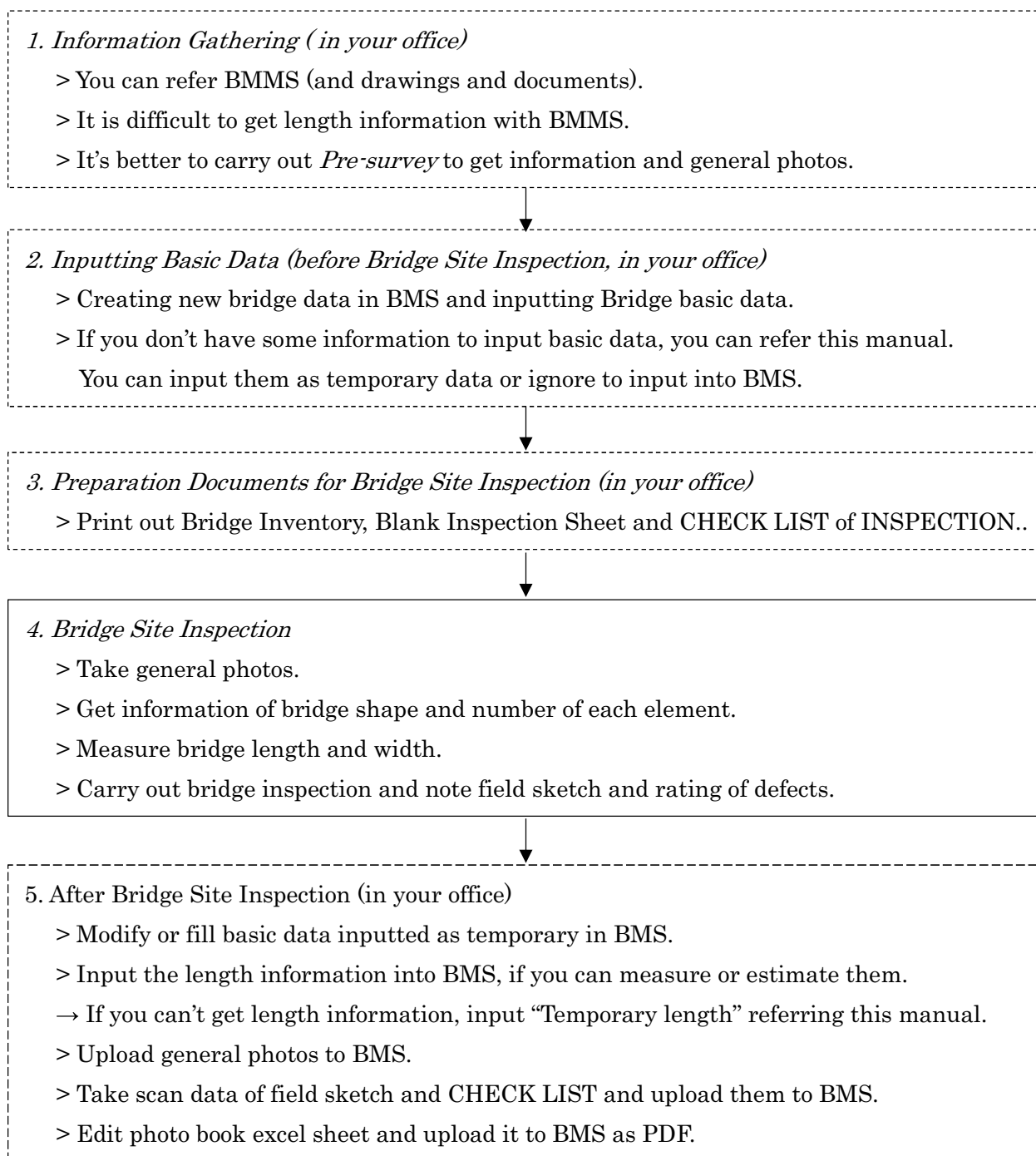


fig. Flowchart of Bridge Site Inspection

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 (refer 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 (refer 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.

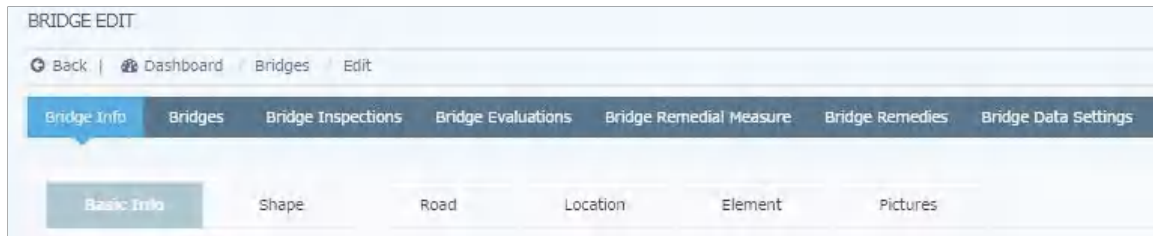
e.g. Height of Main Girder / Width of Main Girder / Interval of Main Girders

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 stream side” and “down stream side”. If the bridge locates upper stream side, add “1” as 13th letter. If down stream 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.

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.

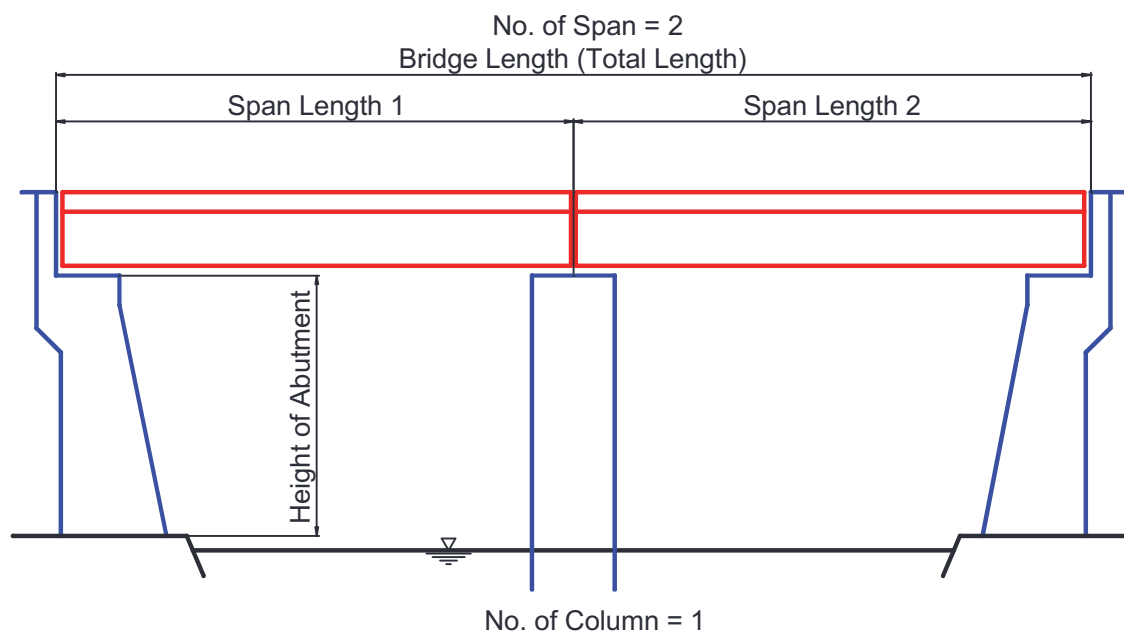
Span wise span length settings

Span-1	Span-2
25.000	35.000

[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

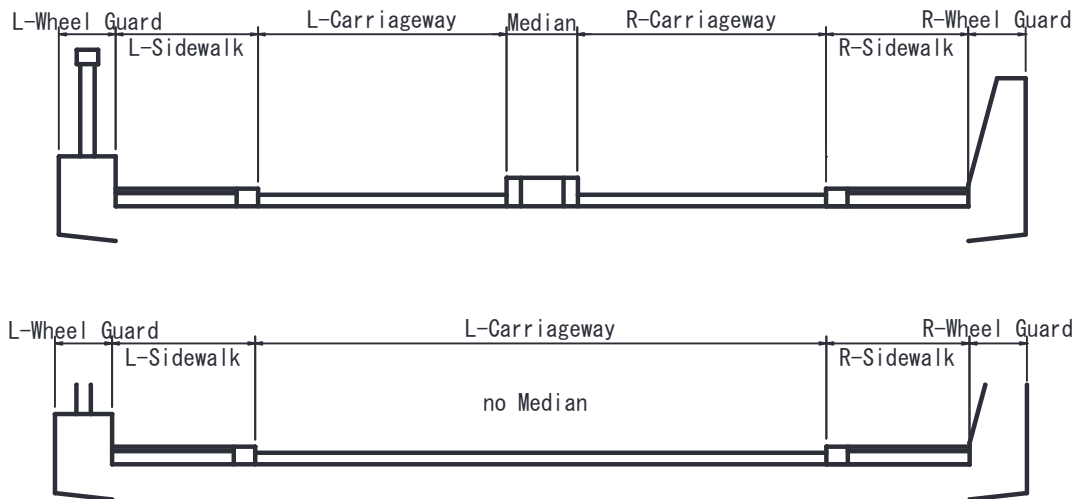
Input shape of substructure.

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)-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.

*[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) and23. 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)

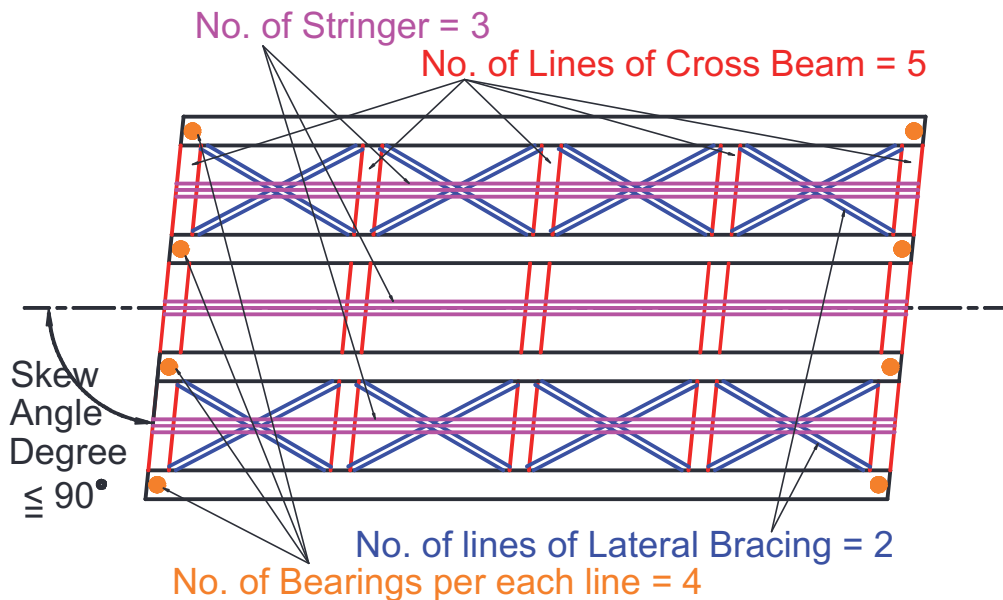
25. No. of Lines of Stringer (Steel Girder Bridge)

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

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

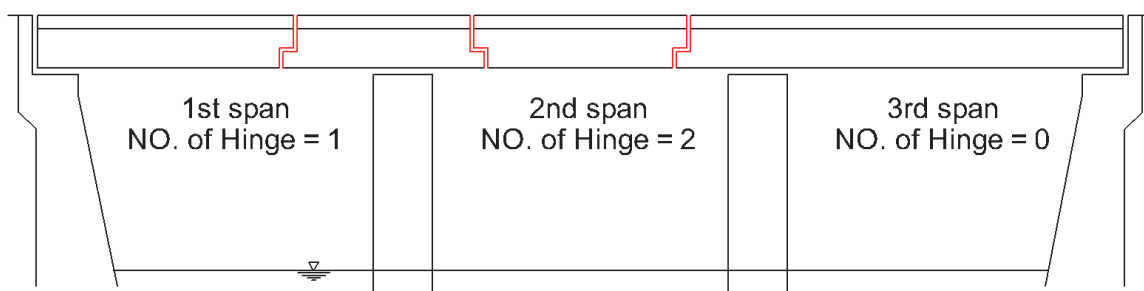
Input number of each lines if the element exists.

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.

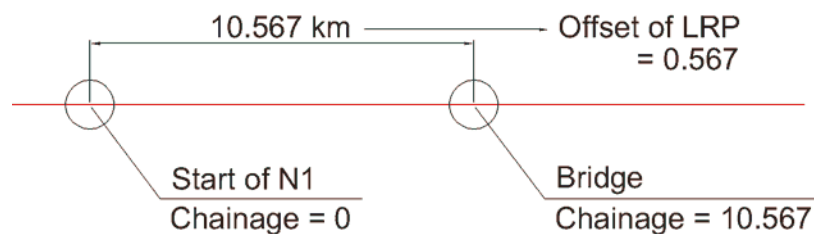
If you don't have the information, this cell should be blank.

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.

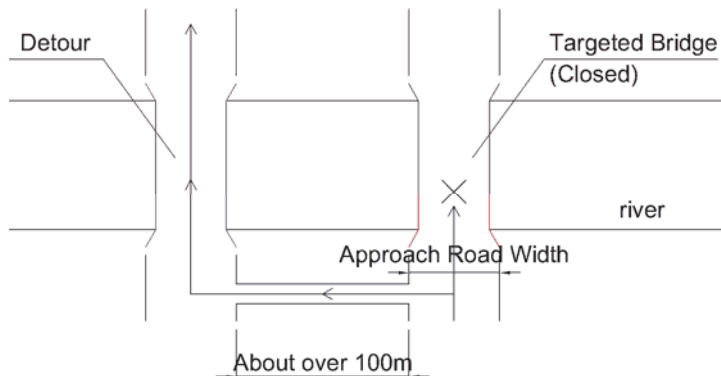
9. Approach Road Width

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).

Search by Road No.

Basic Info			
Road No.	N503		
Road Name	Utholi-Aricha Road		
Class	National Highway	Starts at	Utholi
Length	3.269 Km	Ends at	Aricha
Traffic & Other Info			
Traffic (AADT)	7679 (Motorized: 5785 , Non-Motorized: 1894) Show details		
Average width	7.32 (m) Width Detail		
No. of bridges	8		
No. of ferry ghats	0		
Location referencing points - LRPs (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

$$\frac{\{\text{AADT} - (\text{total number of truck and bus})\}}{\text{AADT}}$$
 (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”.

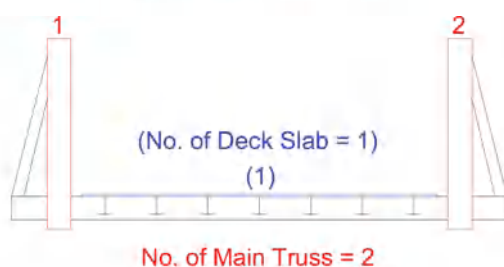
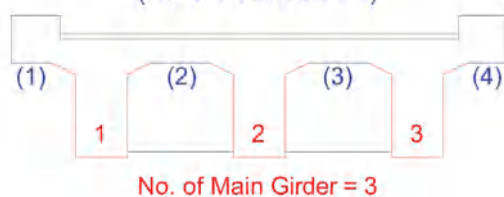
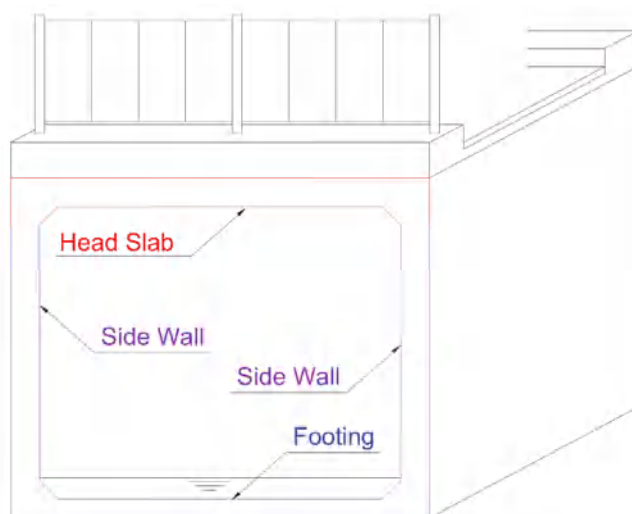
Super-structure

*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	<i>Remarks</i>	-	-	<i>= No. of Main Girder + 1</i>
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	<i>Remark</i>	-	-	<i>= No. of Main Girder + 1</i>

Basic Shape of Girder Bridge / Bailey Bridge / CulvertGirder Bridge (RC)

(No. of Deck Slab = 4)

Portable Steel BridgeCulvert

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

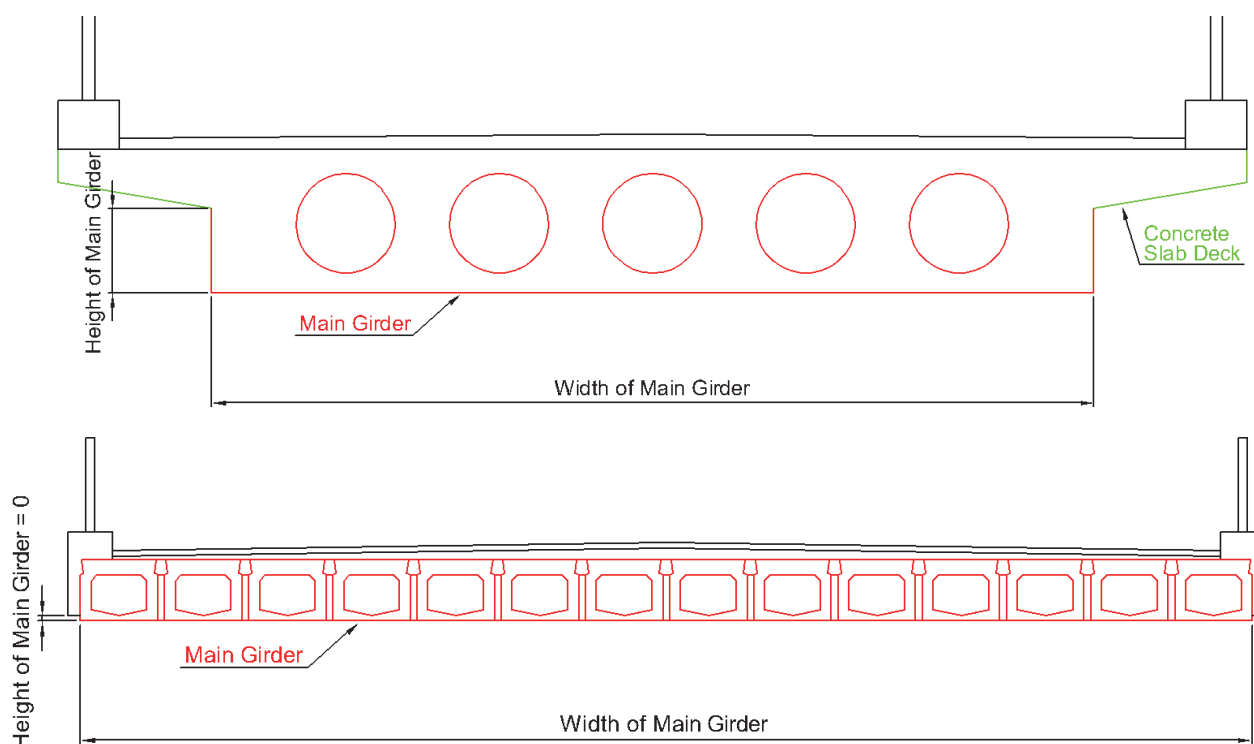
This chapter shows formula to calculate temporary length of main girder or box culvert.

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]



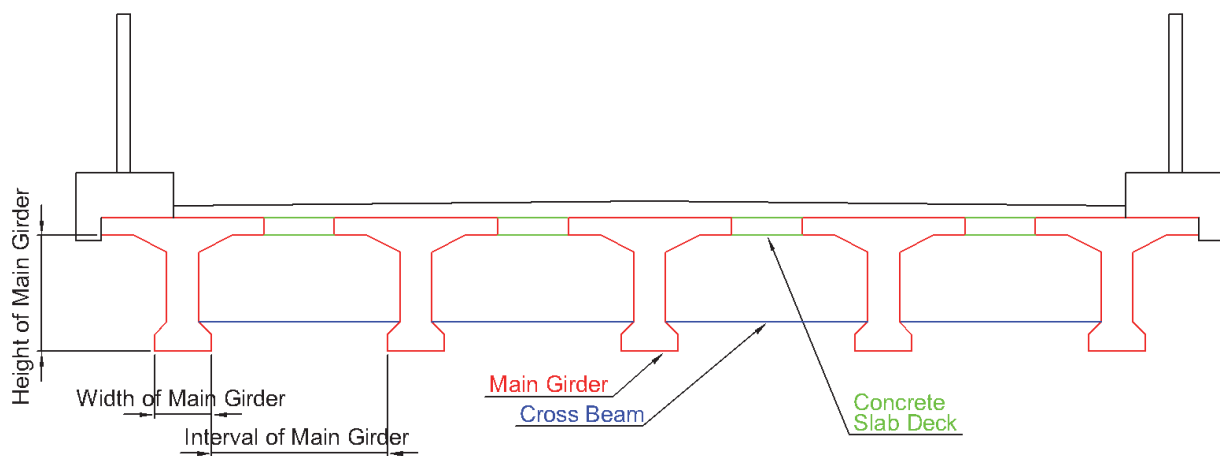
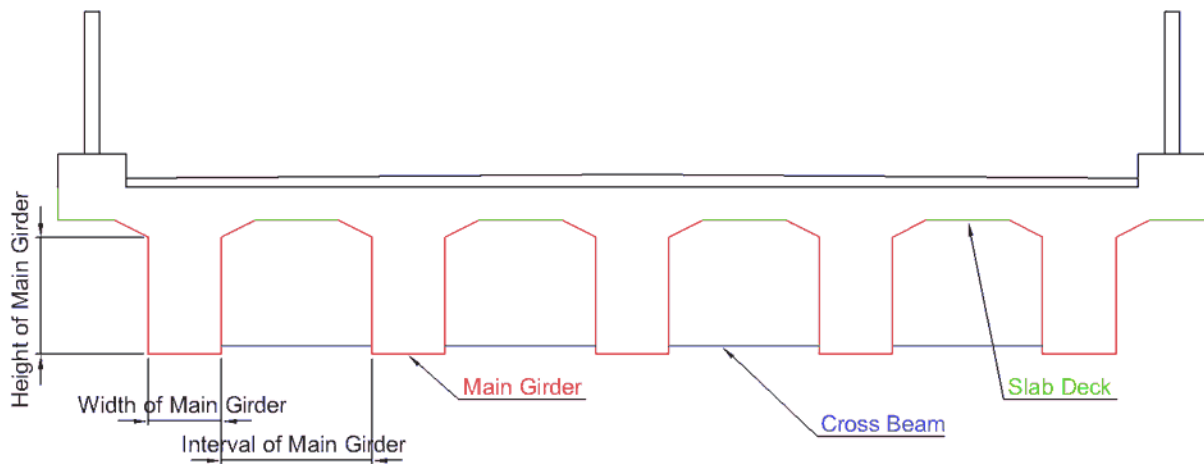
- Interval of Main Girder : input always “0”.
- Height of Main Girder : Temporary = “0”
- Width of Main Girder : Temporary = “Effective Width”

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]



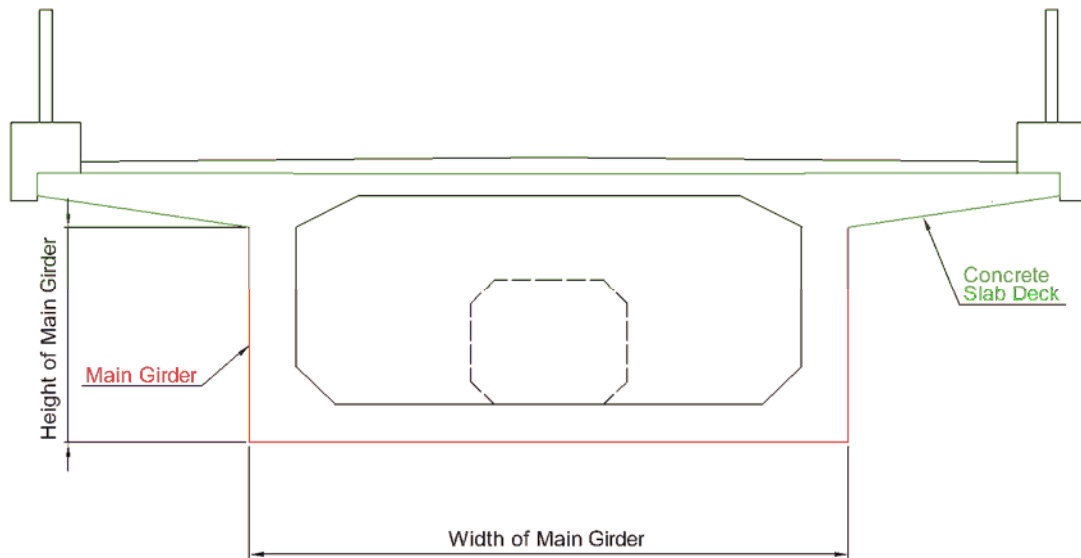
- Interval of Main Girder : Temporary = “Effective Width” / (“NO. of Main Girder” - 1)
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = 0.300 m

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]



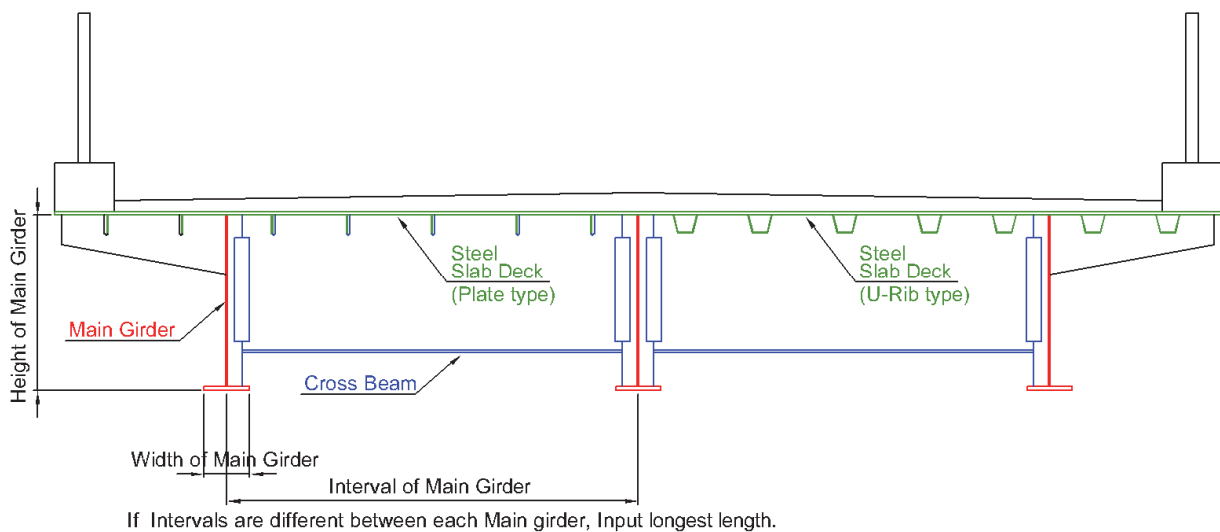
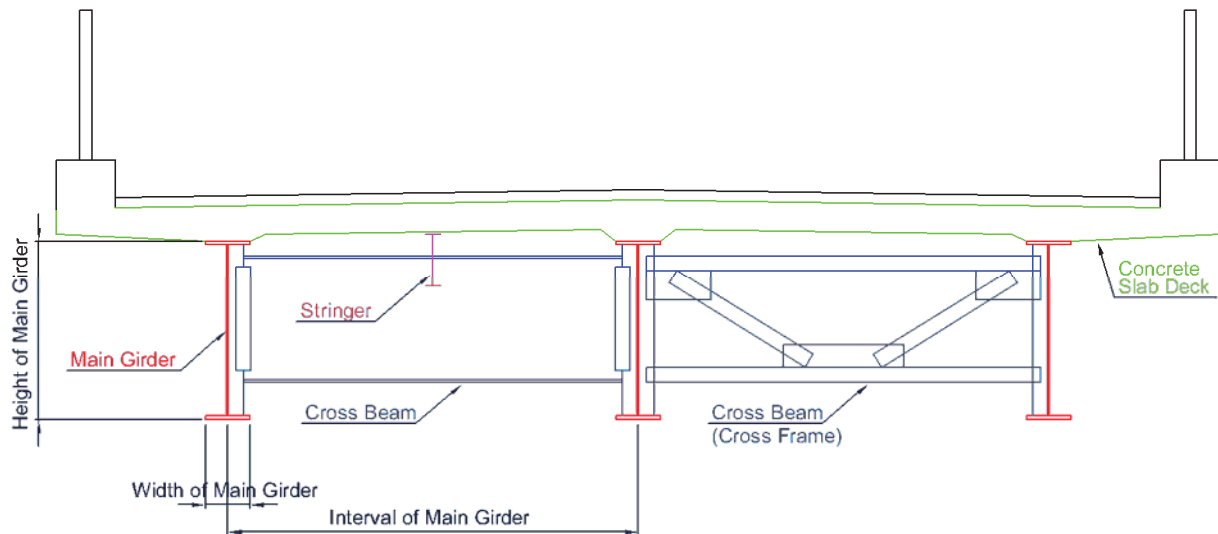
- Interval of Main Girder : input always “0”
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : “Effective Width”

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]



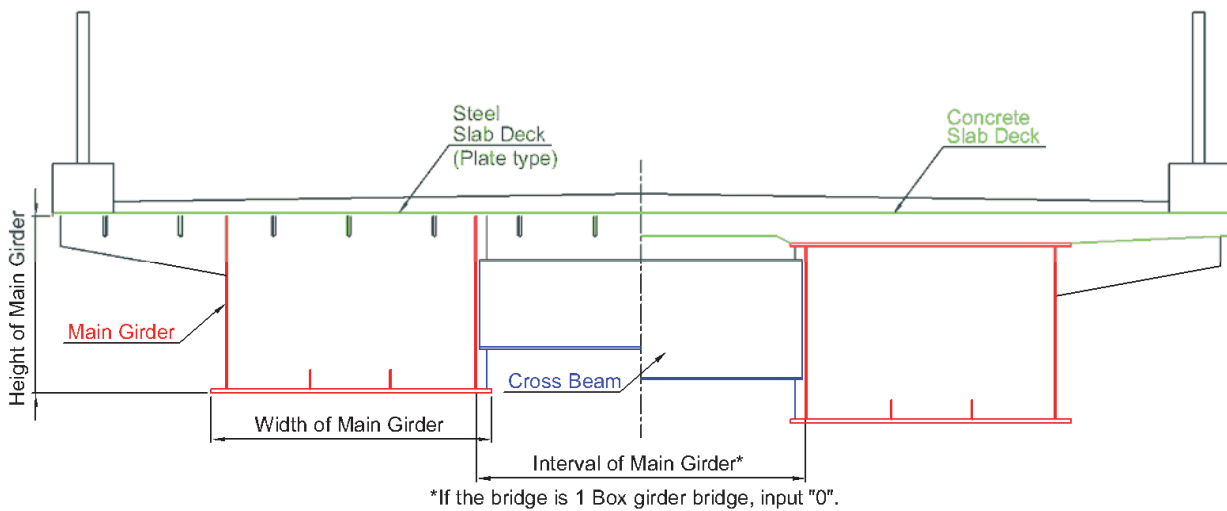
- Interval of Main Girder : Temporary = “Effective Width” / “NO. of Main Girder”
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = “Height of Main Girder” / 5

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 =
"Effective Width" - "Width of Main Girder" x "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)

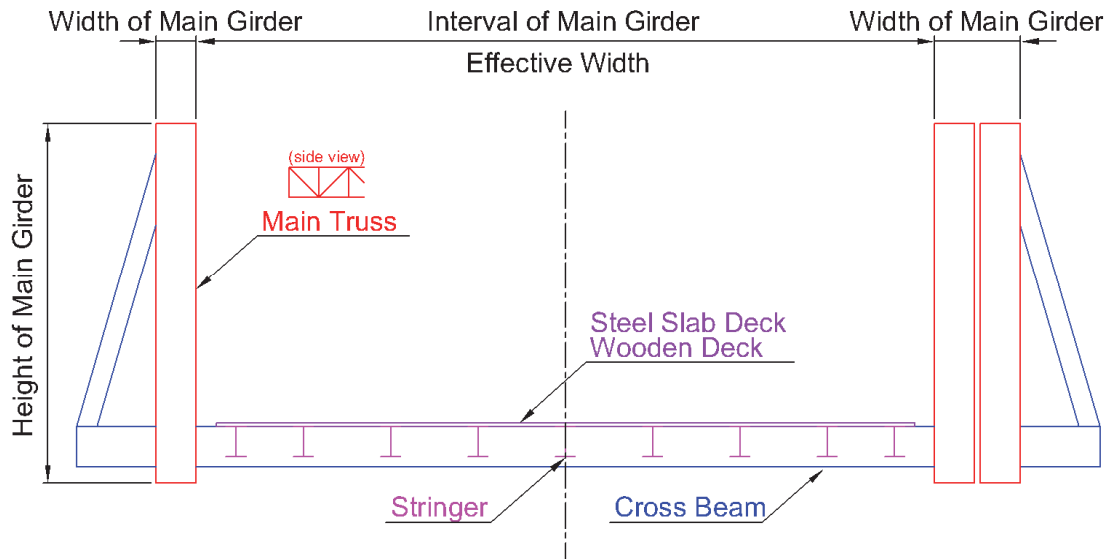
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : Temporary = "Effective Width"
- Interval of Main Girder : input always "0"

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]

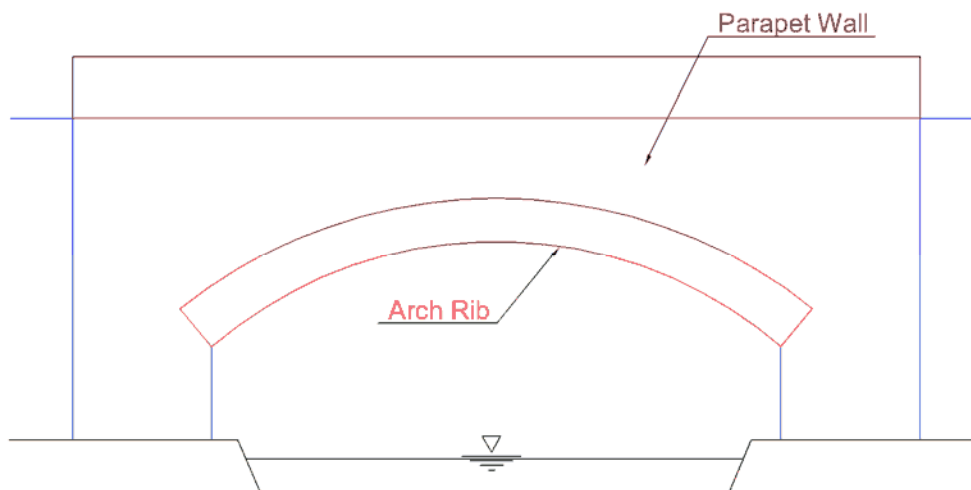


- Interval of Main Girder : always same as “Effective Width”.
- Height of Main Girder : Temporary = 2.000 m
- Width of Main Girder : Temporary = 0.200 m

[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.

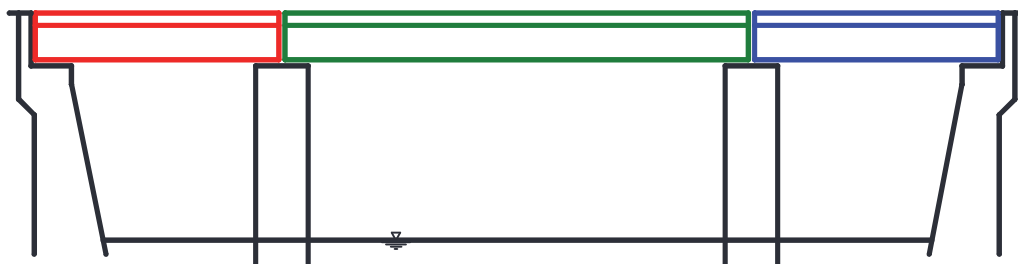
e.g.

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

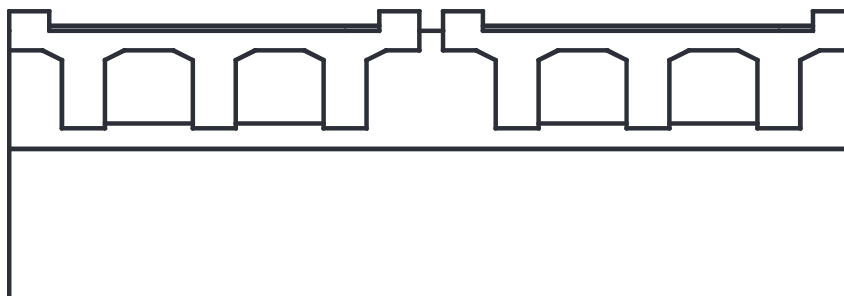
- Number of Main Girder, cross beam and so on of Basic Data should be inputted as maximum number of main girder in all spans.
- Inspection sheet and Evaluation sheet of Mixed Types Bridge consist of “All types of defects” (both of types of defects of “Concrete” or “Steel (rubber)”.

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

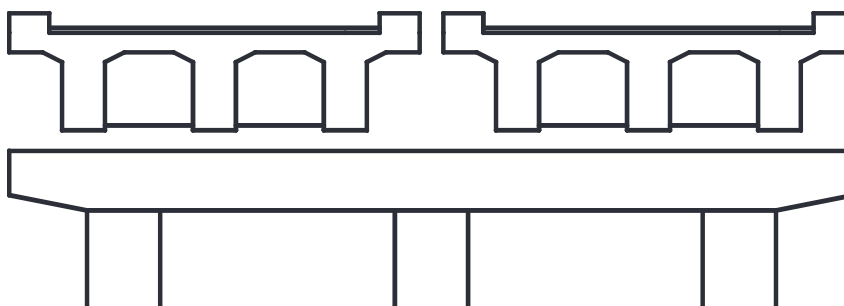
Cells of evaluation sheet not required (e.g. concrete defect of steel element) should be inputted as “N”.

[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

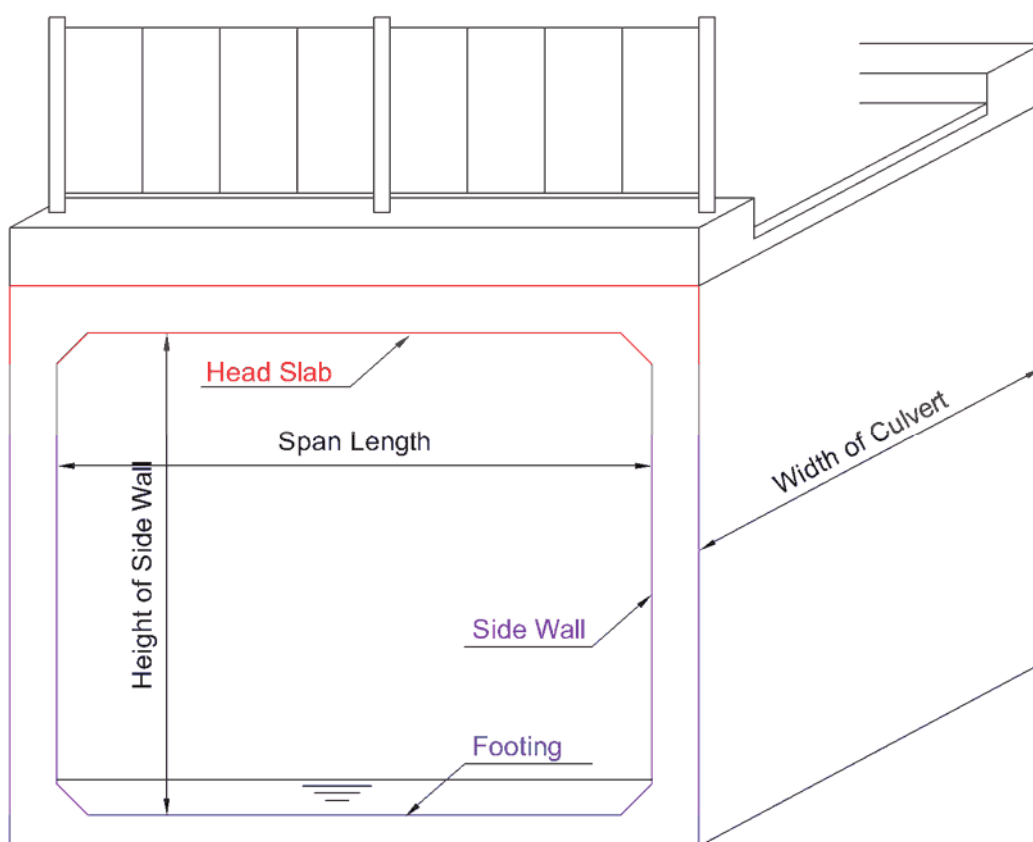


e.g. One Pier with parallel bridges

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 Culvert : Same as “Bridge Width”.
- Height of Side Wall : Temporary = 2.000 m

e.g. Temporary input case

If Bridge width = 7.500m,

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



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