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

Bridge Management System (BMS) Manual

for Inspector& Evaluator 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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Bridge Management System (BMS) Manual

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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.

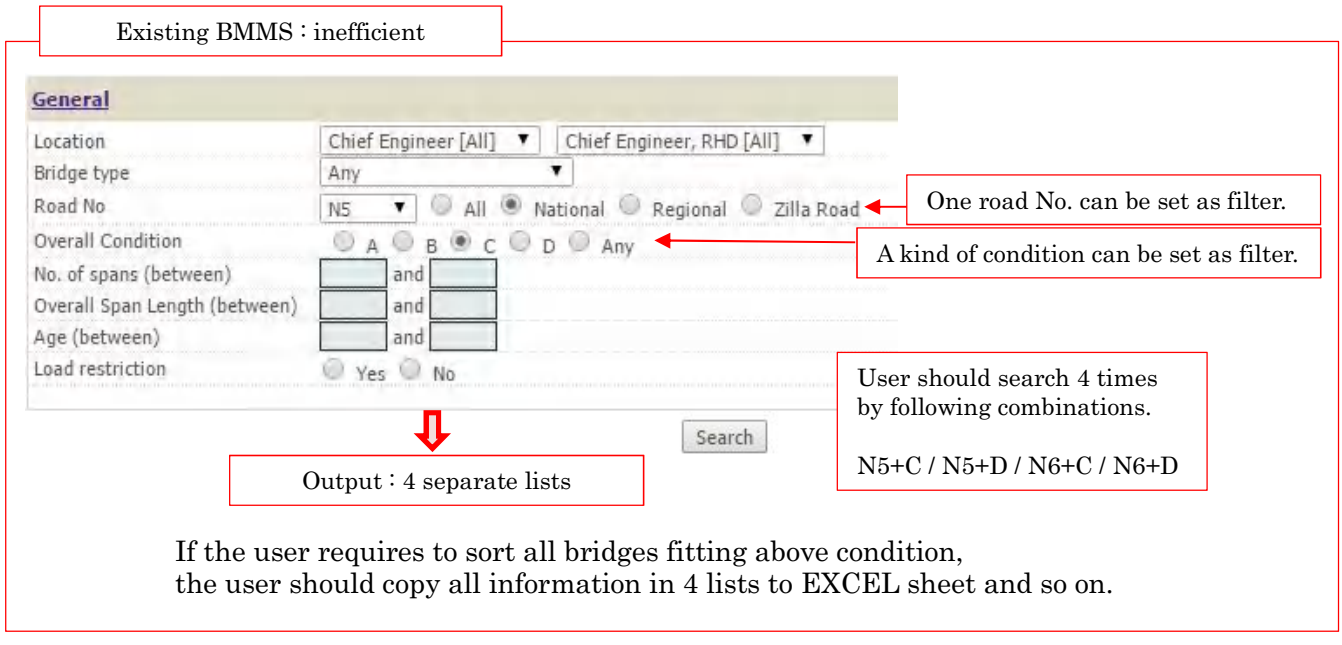
1.3 Usability of BMMS

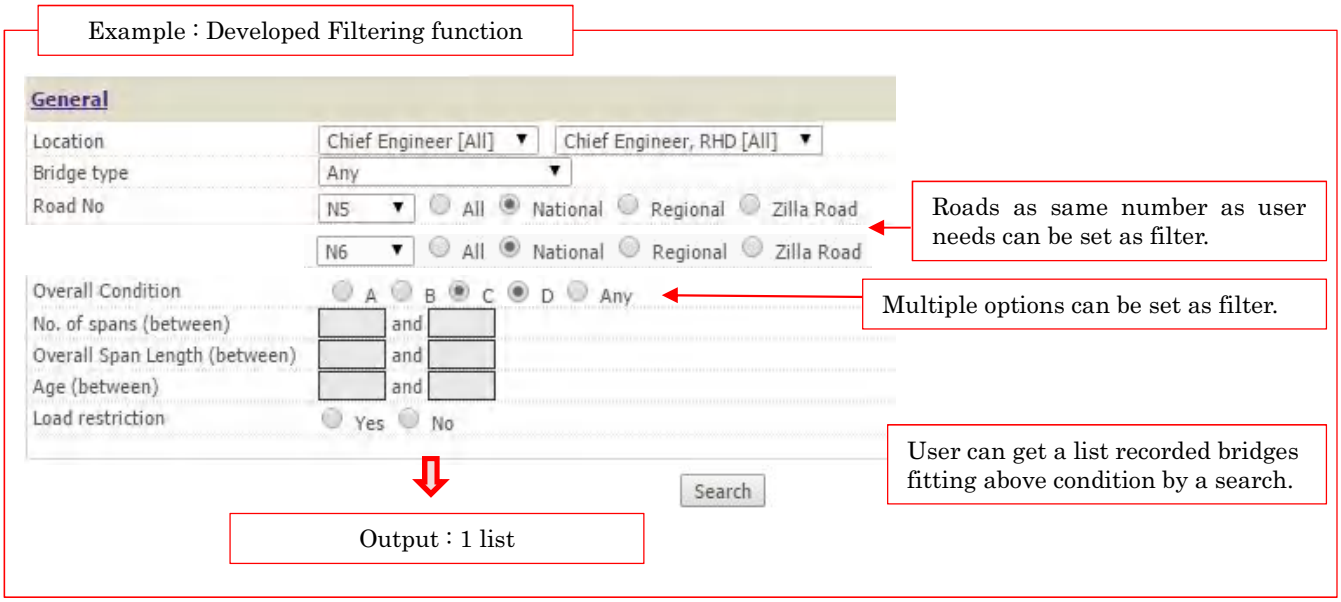
As result of reviewing by operating BMMS and examining past project (EBBIP), project team shows defects in usability of existing BMMS as follow.

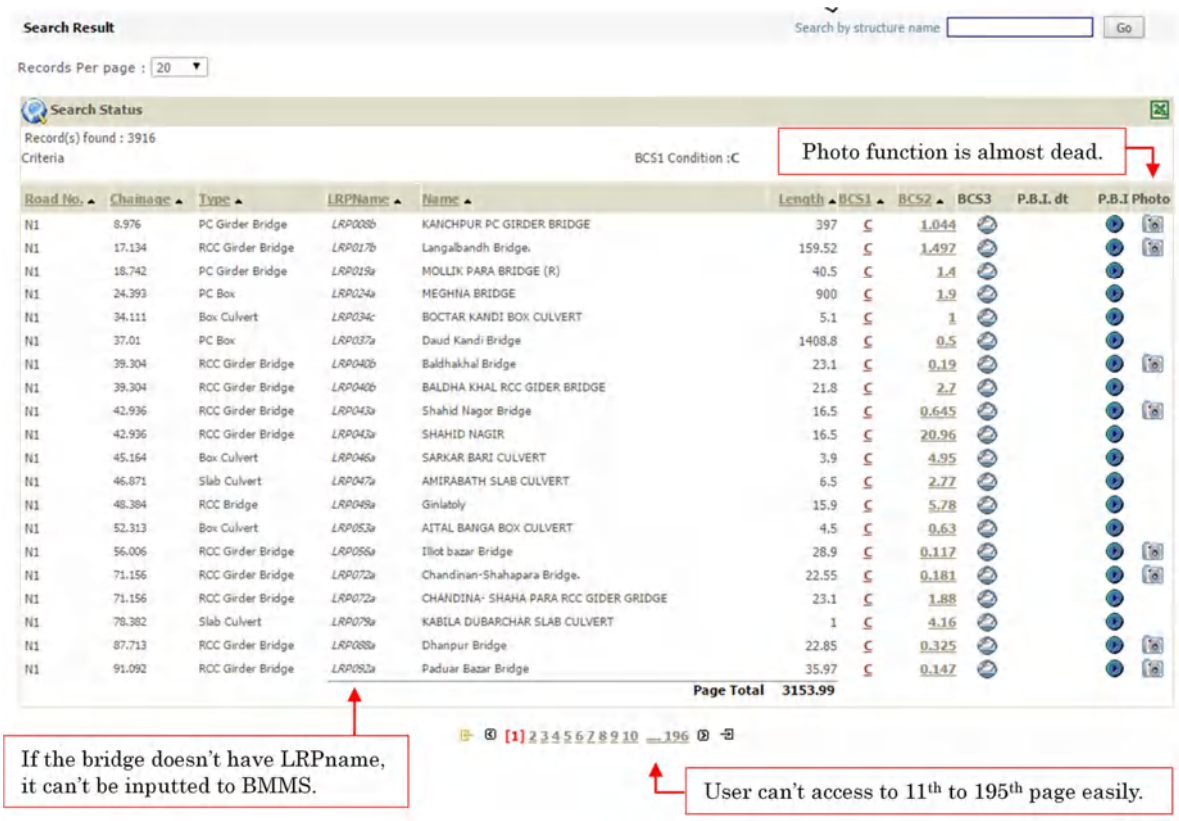
- Operation is difficult, because of no user's manual.
- Filtering function is not enough to search under several conditions.

Example : When user want to search bridges following condition,

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







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

1.4 Result of hearing with BMMS Division and MIS

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

a) They do not have materials of existing BMMS (such as Original manual / Design specification / Source code and original data of first BMMS.)

b) They agreed with the idea of proposed BMS (Bridge Management System, program developed existing BMMS) by JICA project team.

c) They considered that it is impossible to update existing BMMS to new BMS due to lack of materials described above, a).

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

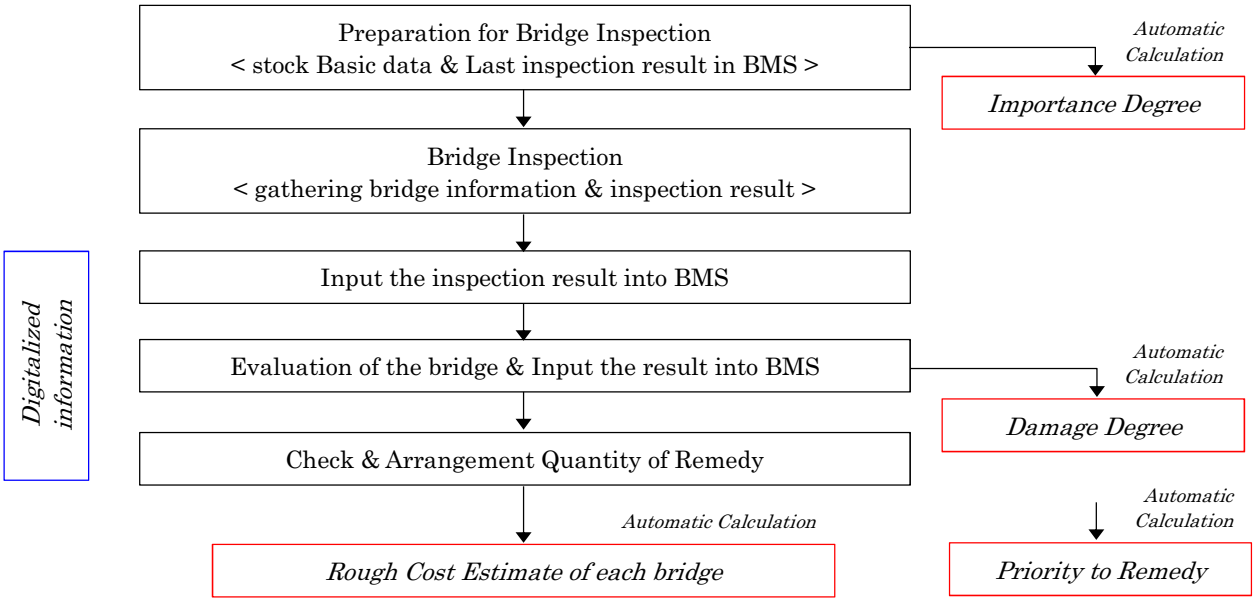
As the result of the interview, JICA project team decided to develop BMS as "New program".

2. INTRODUCTION

2.1 Outline of BMS

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

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



2.2 Role of BMS

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

2.3 Manual of BMS

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

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

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

* Only for 1st Periodic Inspection in 2018, because the periodic inspection is first periodic inspection in Bangladesh and start-of BMS, the BMS doesn't have Basic data of the bridges. However, Basic data inputting operation has two problems peculiar to the starting up.

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

For first problem,

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

For second problem,

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

2.4 Prerequisite Skills

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

3. ROLE BASED ACCESS IN BMS

3.1 Role based access in BMS

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

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

SL	User	Access	Bridge Basic Data			Inspection						Evaluation								Remedy Measure		Remedy list	
			Draft	Need Cross Checking	Final	Blank Sheets	Draft	Need Review	Need Approval	Unsigned	Final	Blank Sheets	Draft	Temporary Final	Recheck	Committee	Unsigned	Unsigned (Committee)	Final	Draft	Final	Hidden	Shown
9	BMW Administration	Add	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-
		Edit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		View	-	-	✓	-	-	-	-	-	✓	-	-	-	-	-	-	-	✓	✓	✓	-	✓
		Delete	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	BMW officials	Add	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-
		Edit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		View	-	-	✓	-	-	-	-	-	✓	-	-	-	-	-	-	-	✓	-	✓	-	✓
		Delete	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	Member of the committee	Add	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-		-		-
		Edit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		View	-	-	✓	-	-	-	-	-	✓	-	-	-	✓	✓	-	✓	✓	✓	✓	-	✓
		Delete	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Committee Chair	Add	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	✓		-		-
		Edit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		View	-	-	✓	-	-	-	-	-	✓	-	-	-	✓	✓	-	✓	✓	✓	✓	-	✓
		Delete	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

3.2 BMS function which Each User can Use

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

				1	2	3	4	5	6	7	8	9	10	11
SL	**Function Category**	**SL**	**BMS Functions**	**BMS System Admin**	**BMS Data Entry Operator**	**BMS Data Cross Checker**	**Inspector**	**Sr. Inspector**	**Chief Inspector**	**Evaluator**	**Appraisal Committee**	**BMW Management**	**BMW Officials**	**Public User**
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 mendatory. 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 emty.
- 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 inputed by data entry operator. If any correction required, the user open the bridge in edit mode and do the necessary correction. After all corrections the bridge data can be set as final. This data is then used for other bridge operations like – inspection, evaluation etc. Final data cannot be changed or deleted if it is used in any other operations.

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

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

3.6 Inspector (Inspector, Senior Inspector and Chief Inspector)

Ispection 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 categogies in BMS. Evalutor 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

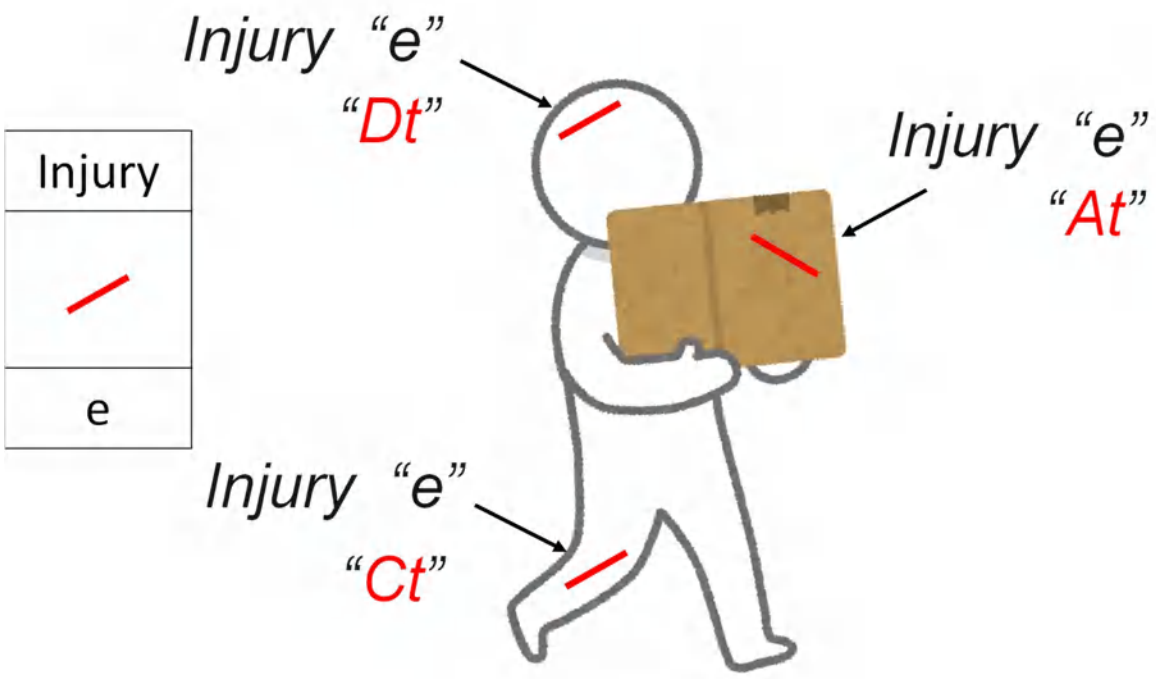
  : Inspector only records “location and scale of defects” and “Rating of Defects” comparing with the defects and Inspection manual.

  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 0pt ~ 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"]

Coefficient of Element Main Girder x1.00	x	Coefficient of Type of defect Corrosion x0.50	x	Evaluated degree Bt 33 pt	= 16.5pt

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 0pt ~ 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 0pt ~ 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 x 60 + 0.4 x 80 = 36 + 32 = 64pt
- Bridge in deep mountain : 0.6 x 80 + 0.4 x 10 = 48 + 4 = 52pt

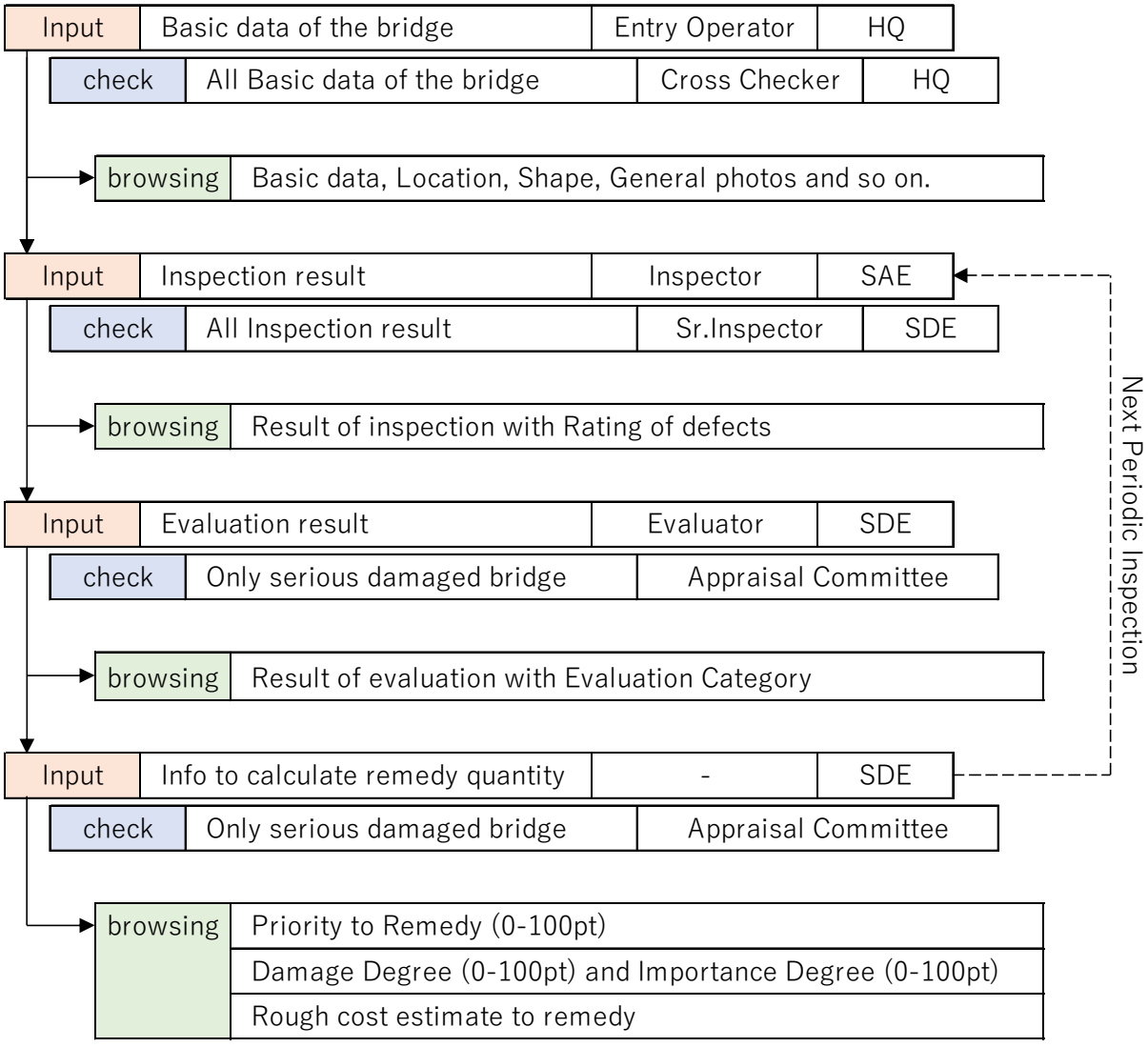
Therefore, national road bridge should be remedied at first.

5. 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.

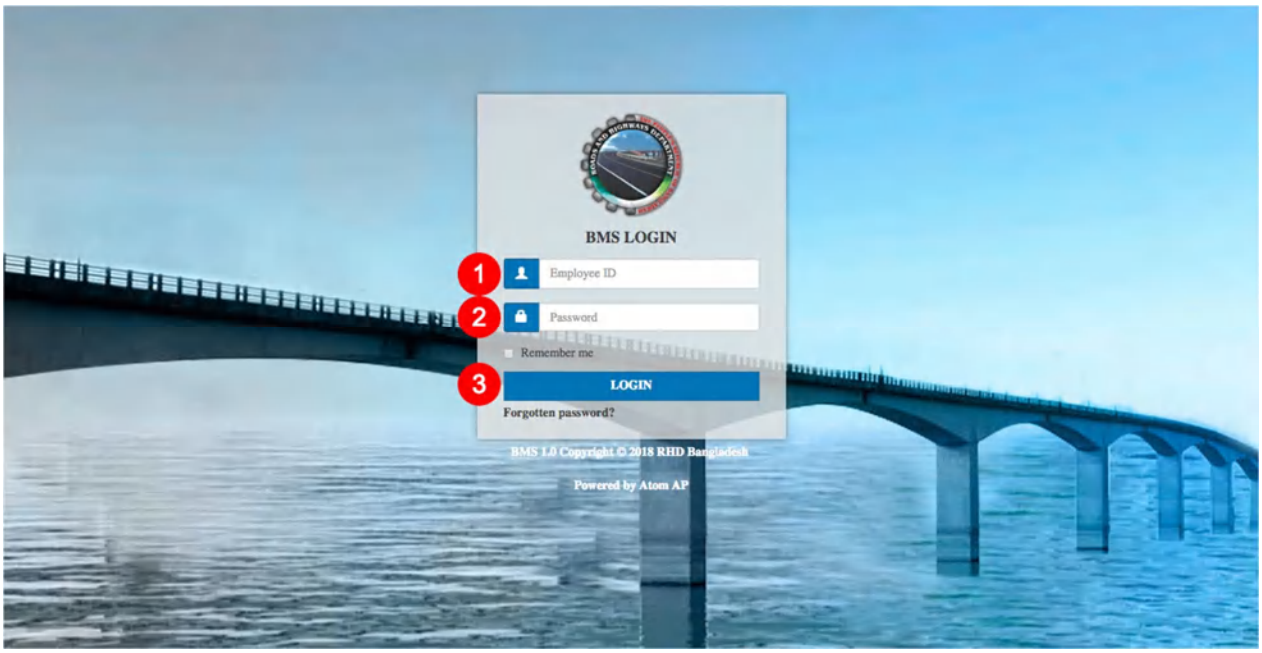
5.1 Flowchart of BMS in Periodic inspection

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

5.2 Login



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

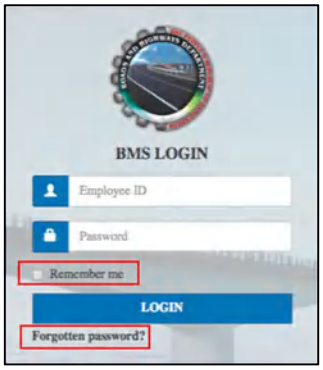
1. Enter valid **Employee ID**

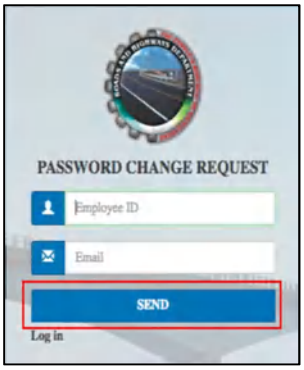
2. Enter **Password**

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.

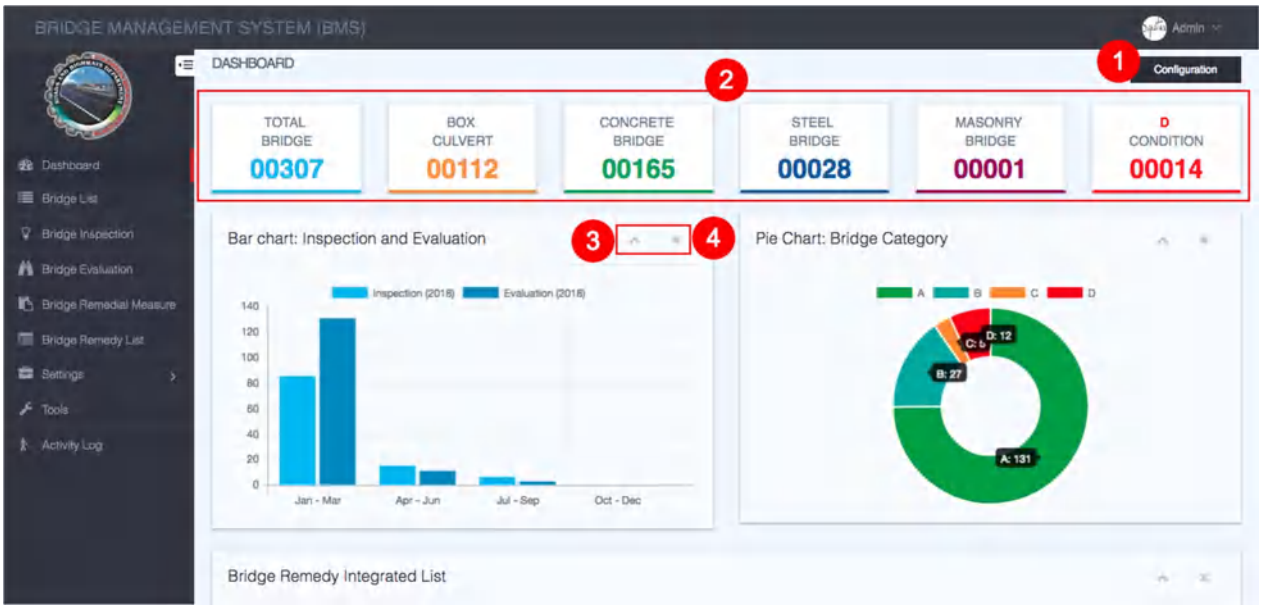
Forgotten Password: To retrieve password click on this link. It will open another page. Input **"Employee ID"** and **"Email"** and click **"Send".** A new password will be sent to the inputted email address.





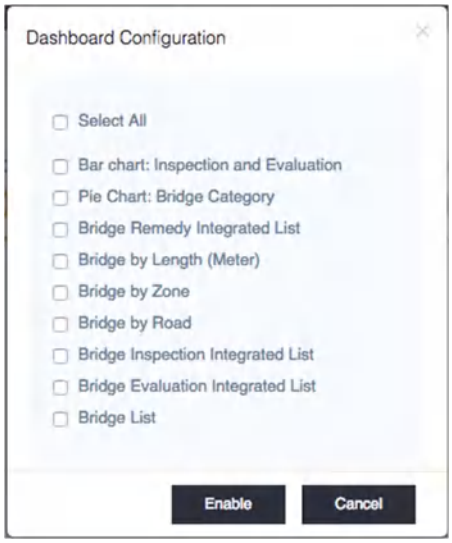
5.3 Dashboard

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".**

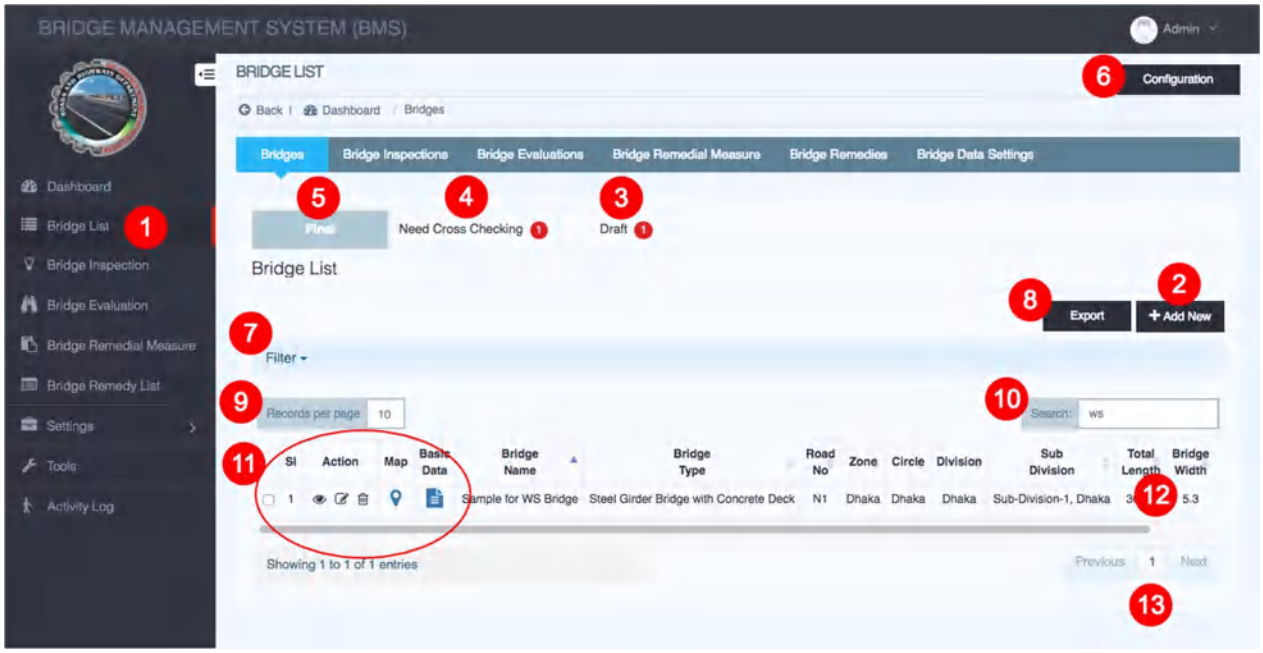


2. This section shows an overview of the data available in BMS.
3. To minimize the section click on this **^** button. To maximize the section views again click on this button.
4. To close any section click on this **x** button. To re-enable that section follow the steps in number 1 (Configuration).

5.4 Browsing of Basic Data

5.4.1. Outline of "Bridge List" page

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

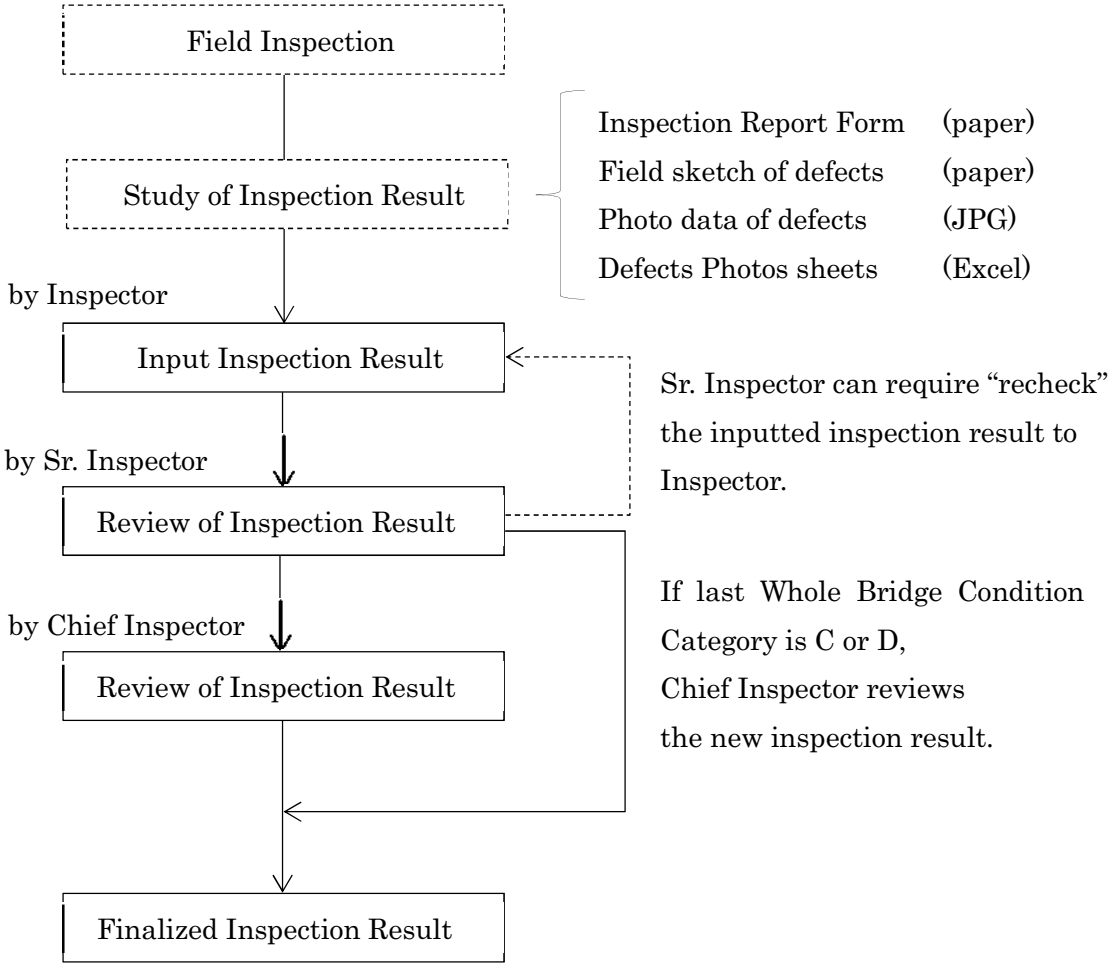


1. Click **"Bridge List"** to view bridge list page.
2. Click **"Add New"** to add new bridge data into BMS.
3. Click **"Draft"** tab to view all bridge data saved as draft.
4. Click **"Need Cross Checking"** tab to view all bridge data for cross checking.
5. Click **"Final"** tab to view all bridge 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.

5.5 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".



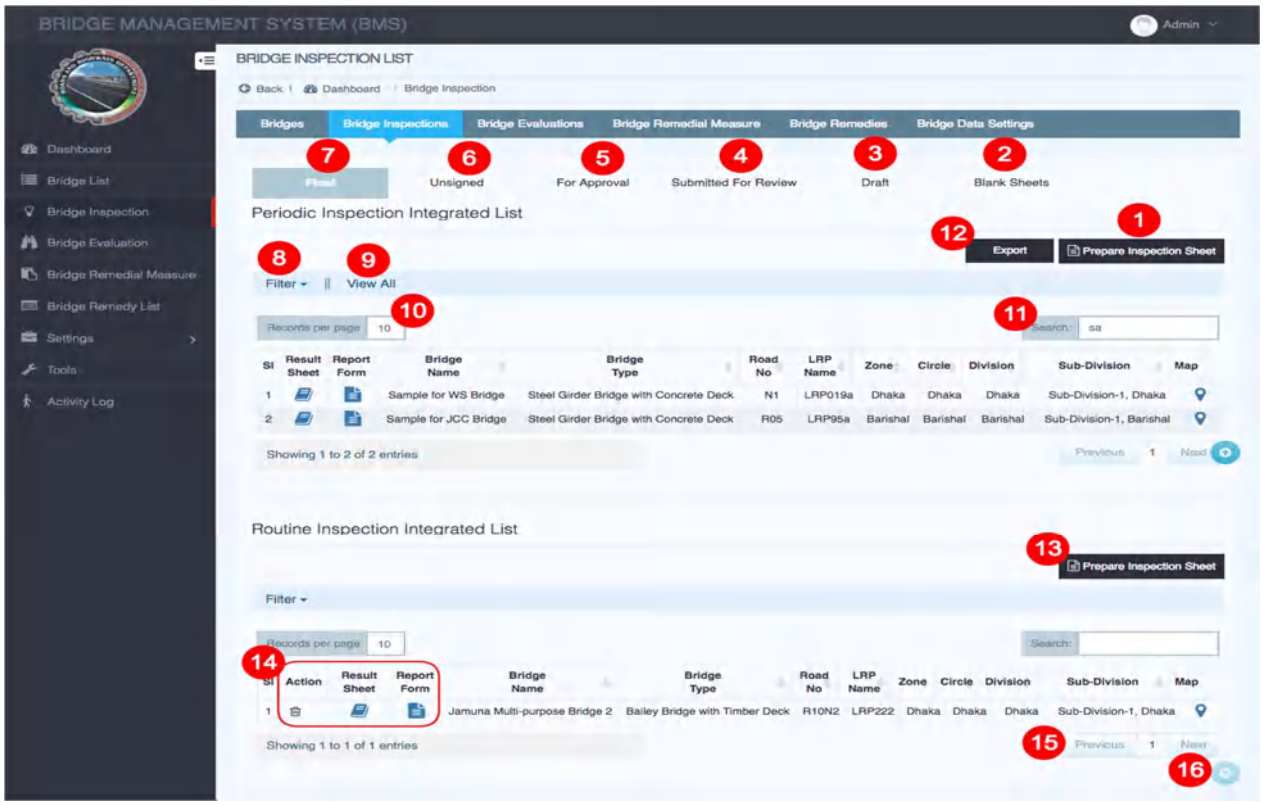
5.5.1. Preparation to input Inspection Result.

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)

5.5.2. Outline of "Bridge Inspection" page

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



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.

5.5.3. Step-by-step instruction for Inspector

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

Note

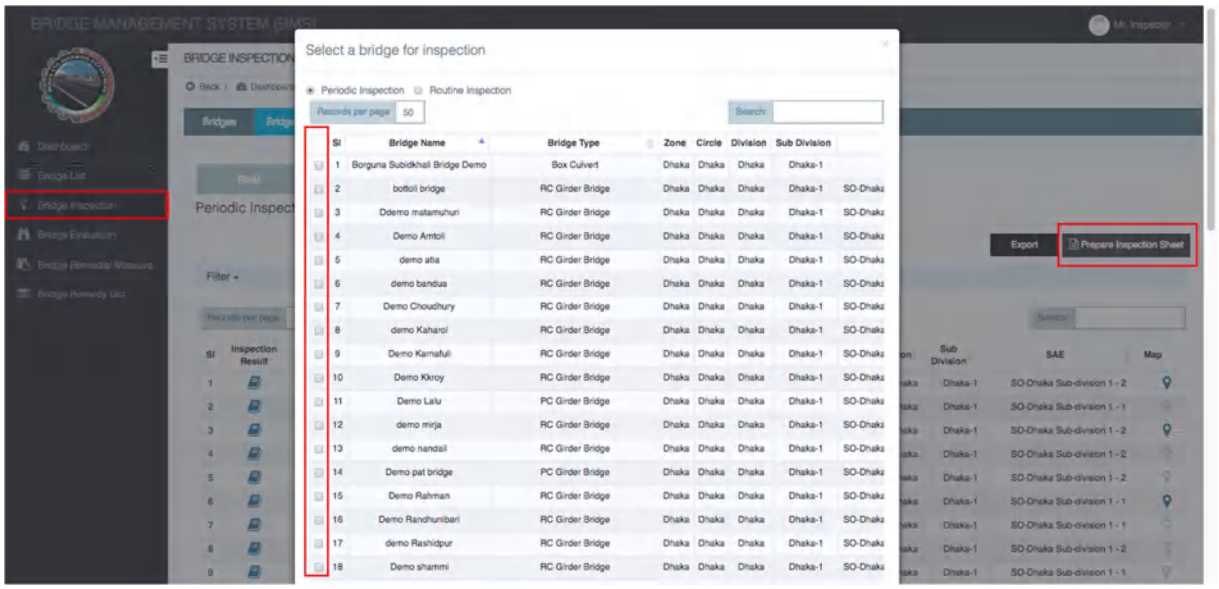
If you find bridge basic data to be modified during field inspection, you have to inform them to Sr. Inspector. After Sr. Inspector confirms and approve them, Sr. Inspector sends email to inform them with specified form to Data Entry Operator.

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



(a) Click “Prepare Inspection Sheet”.

(b) Choose “Targeted Bridge” in Periodic Inspection Integrated List and click “New Sheet”.

(c) Click “Print”. You can get the bridge inventory and last result of inspection of the bridge.

(d) You bring them to field inspection and note rating of defects into the blanked sheet.

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

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

Therefore, operate from step “e.”

Bridge Inventory

Bridge Inventory consists of following items.

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

(a) Click “Prepare Inspection Sheet “.

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

(c) Click “New Sheet”.

(d) Click “Create”.

Note

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

Preparation to input Inspection Result into BMS

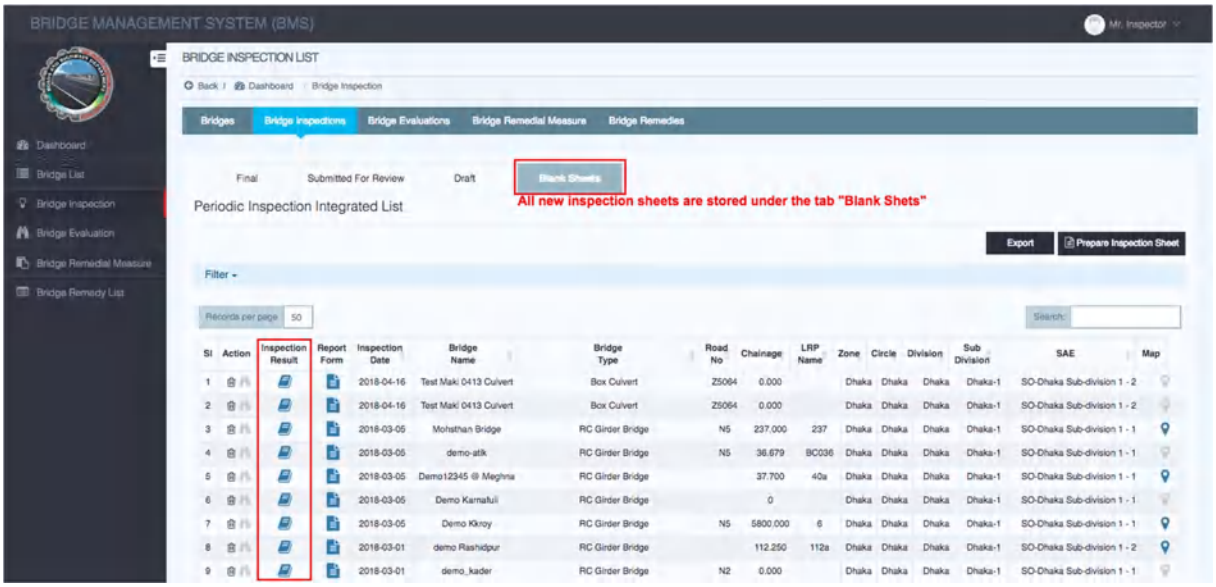
(a) Complete and check the paper documents.

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

(c) Make Defects Photos sheet with Form of Excel.
You can download the form from link at login page of BMS

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

Input Inspection Result into BMS



(a) Click “Bridge Inspection”.

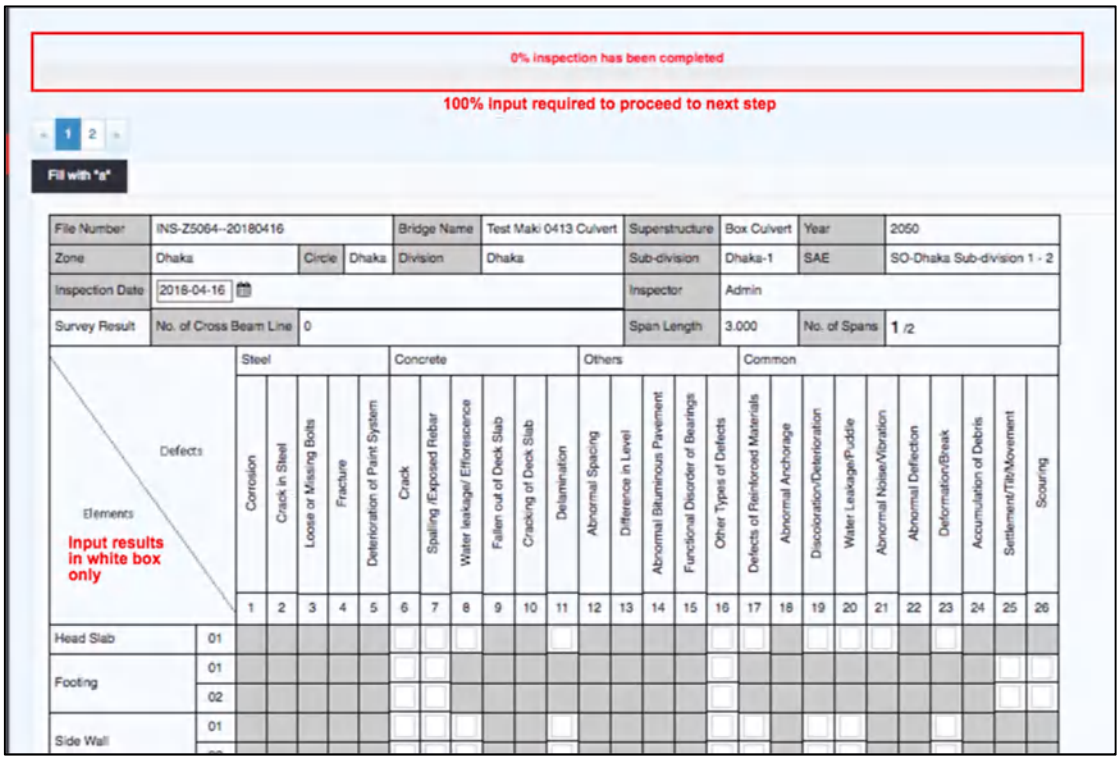
(b) Click “Prepare Inspection Sheet “.

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

(d) Click “New Sheet”.

(e) Click “Create”.

(f) Click “Blank Sheets” in Bridge Inspection.



(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.

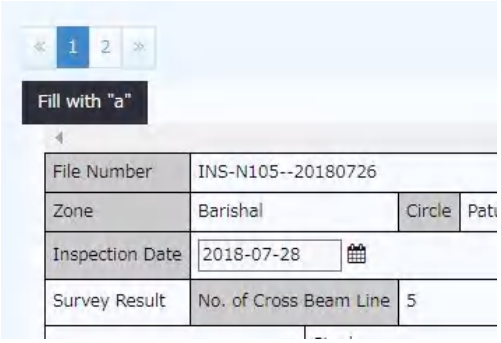
- "uploading Image file"

File type : JPG or PNG

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

Note

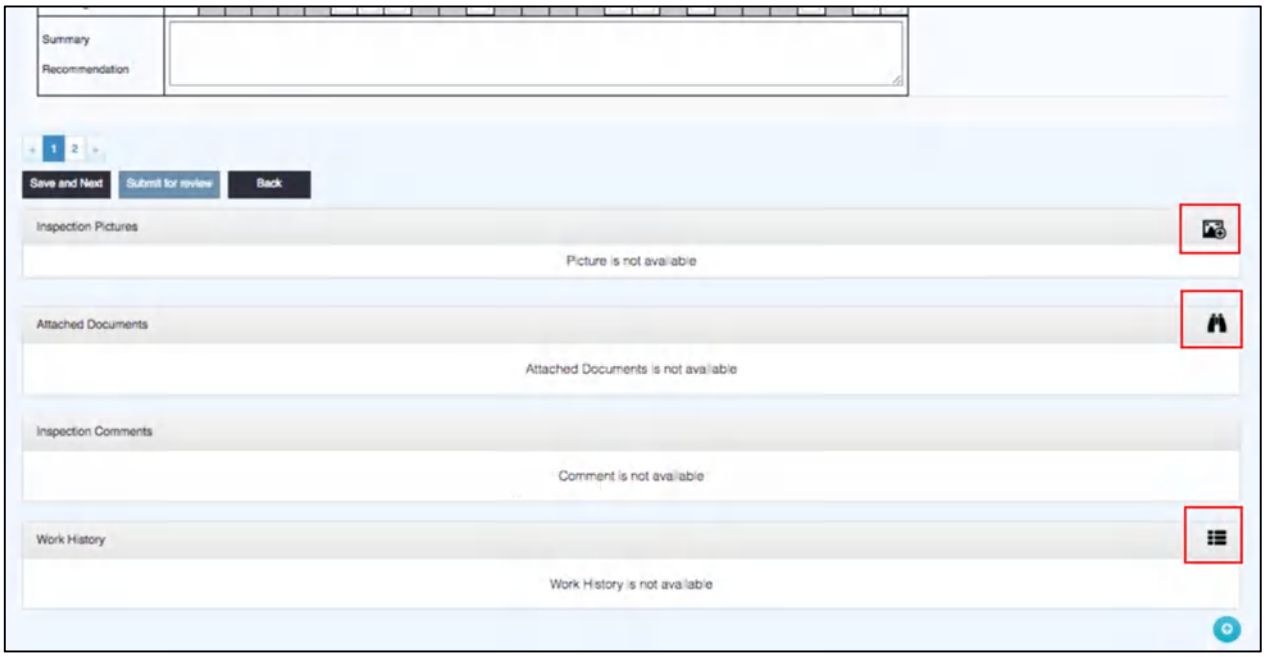
After inputting rating "b, c, d, e", you can use "Fill with "a"" function. By clicking "Fill with "a"", blank cells are filled with "a" automatically.



(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.



(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".

5.5.4. 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.

5.5.5. 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.

5.6 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".

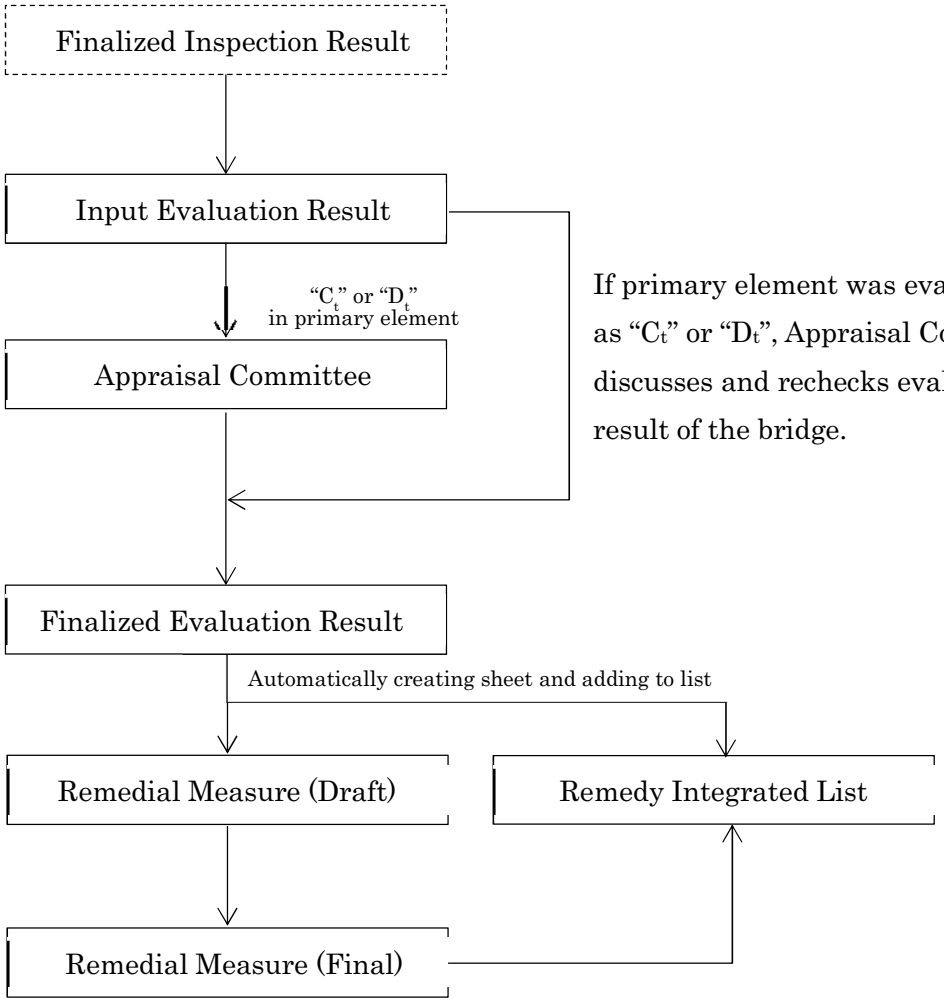


Figure. Flowchart of inputting Evaluation Result into BMS

5.6.1. Preparation to input Evaluation Result

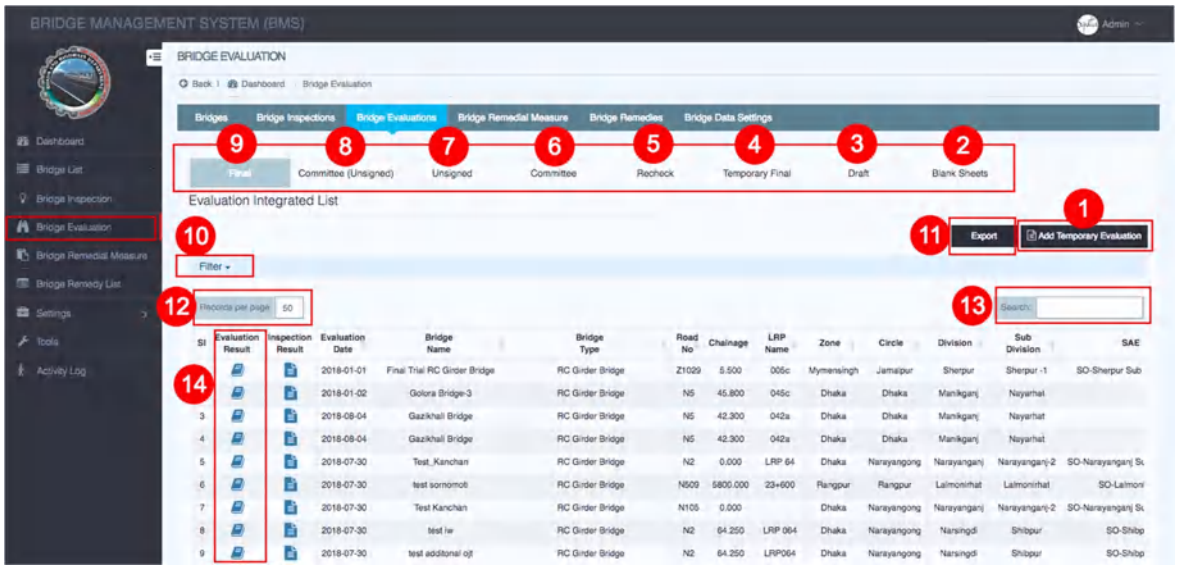
Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

It is better to print out following items.

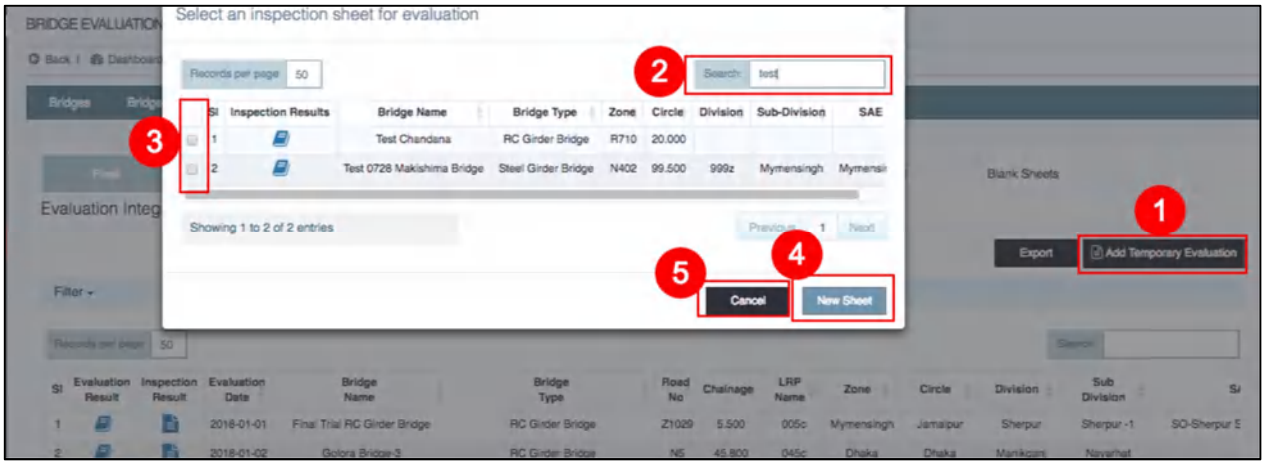
- Inspection Result sheets
- Field sketch of defects
- Defects Photos sheets

5.6.2. Outline of "Bridge Evaluation" page

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



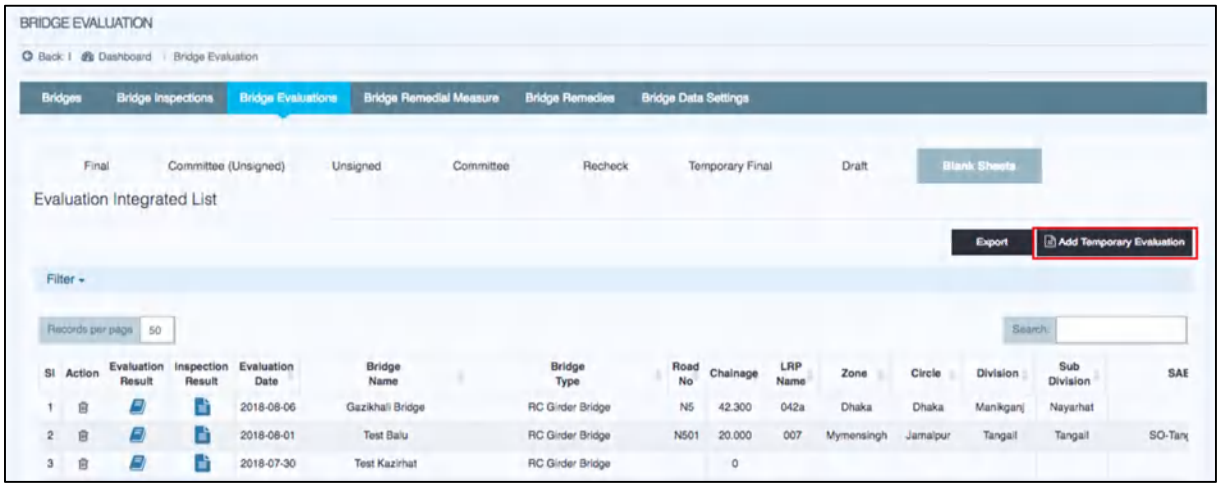
1. Click **"Add Temporary Evaluation"** to create new evaluation sheet.
2. Click **"Blank Sheets"** to view all blank evaluation sheets.
3. Click **"Draft"** to view all draft evaluation sheets.
4. Click **"Temporary Final"** to view all temporary final evaluation results.
5. Click **"Recheck"** to view 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.

5.6.3. 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".

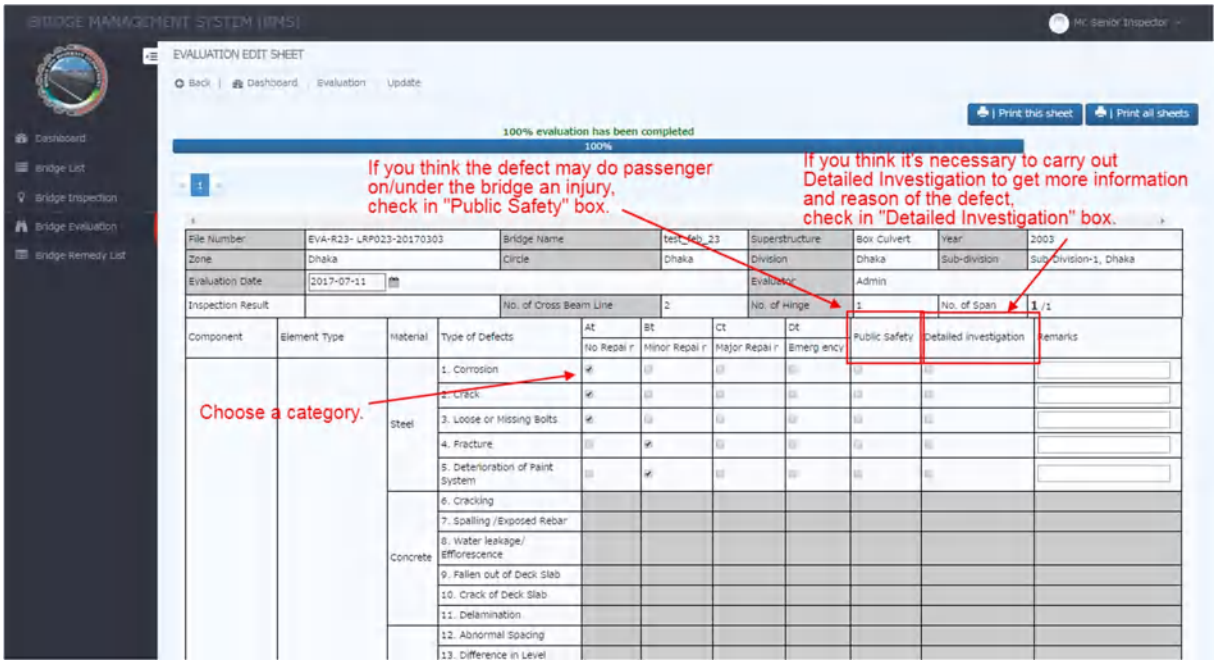
Note

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.



(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.

5.6.4. Step-by-step instruction for Appraisal Comittee

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".

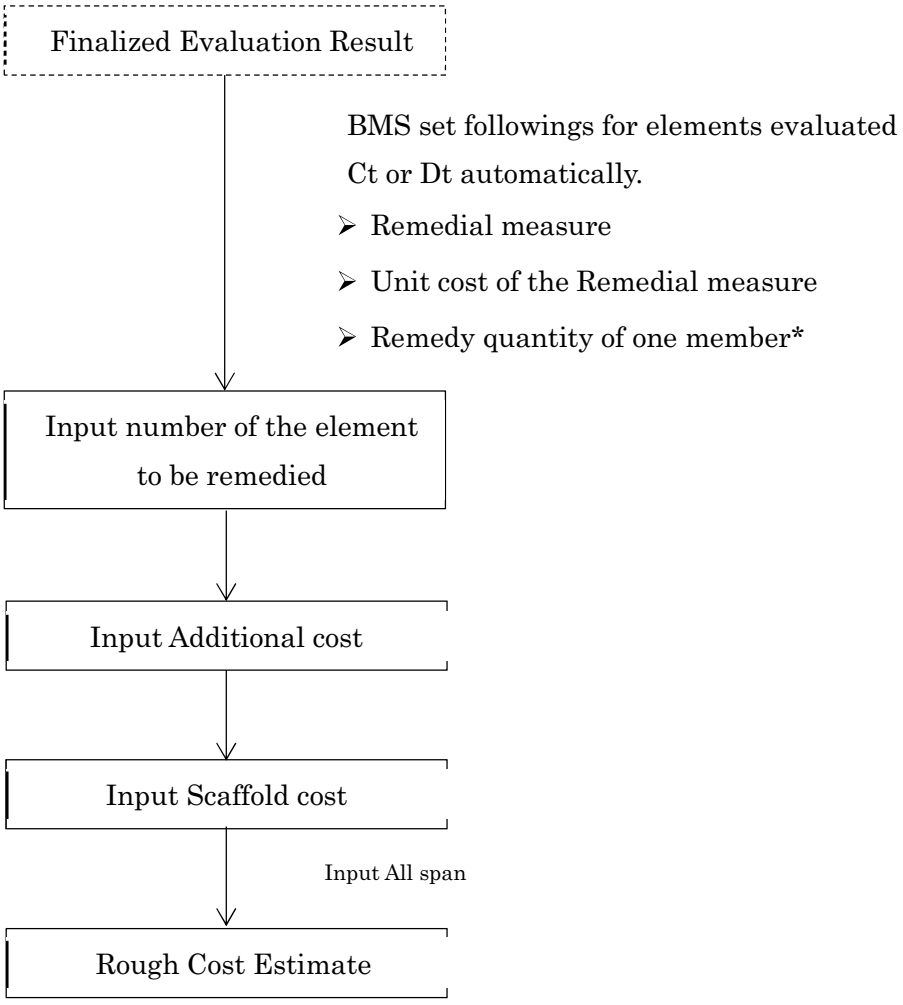
(d) Check and discuss with the EVALUATION APPROVAL SHEET.

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

5.7 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.

5.7.1. Preparation to input remedy information

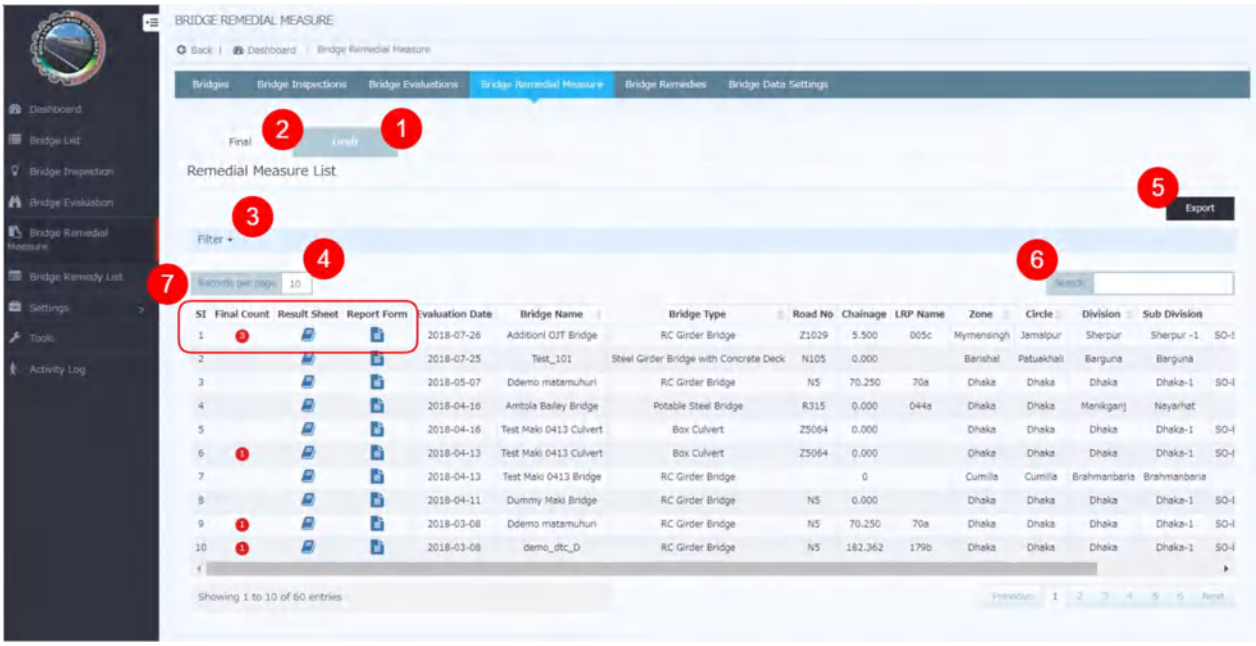
Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

It is better to print out following items.

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

5.7.2. Outline of "Bridge Remedial Measure" page

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



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.

5.7.3. Step-by-step instruction for Bridge Evaluator

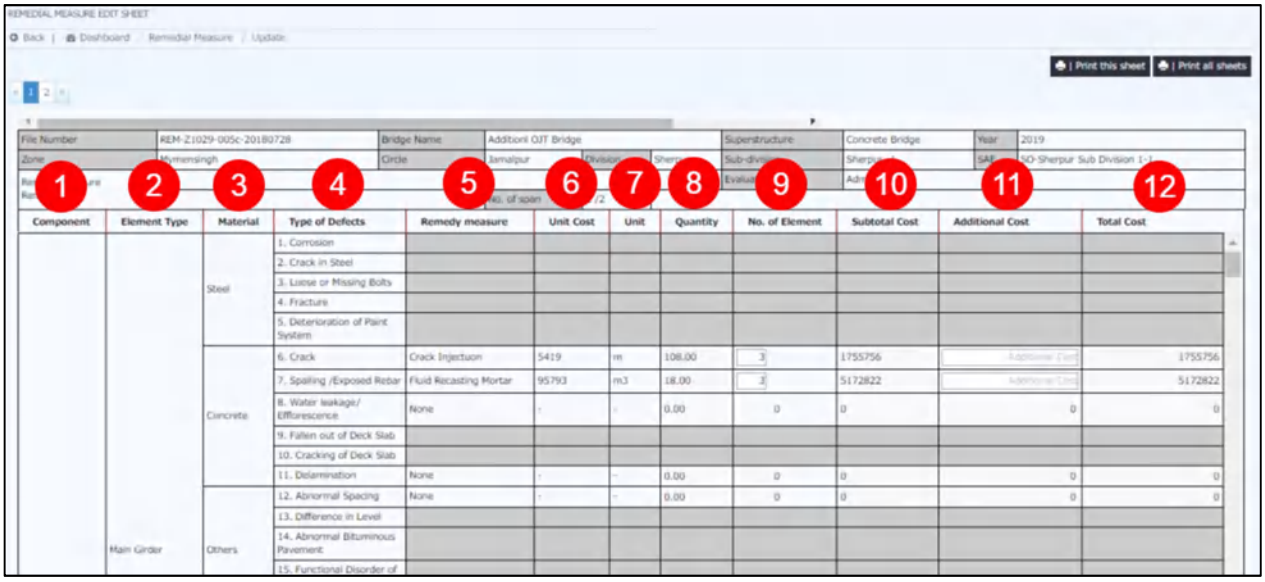
Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

(a) Click "Bridge Remedial Measure".

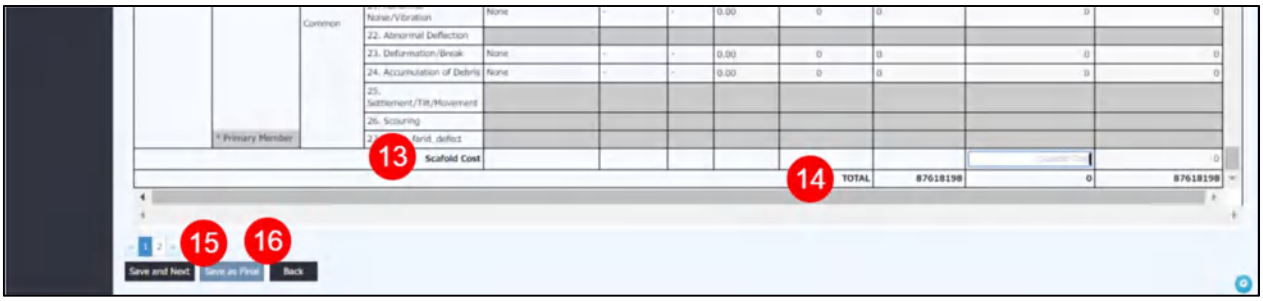
(b) Click "Draft".

(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

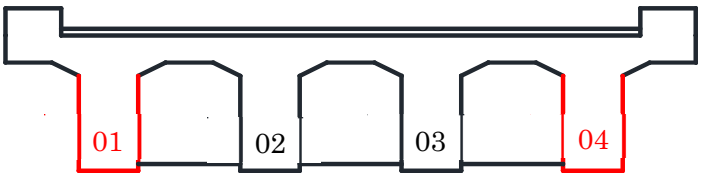
This note shows how to consider "No. of Element" to be remedied.

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.

[Unit Cost of Scaffold (tk/m2)] x [Span length] x [Bridge Width] x [ratio of setting area]

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

= 20,279 tk/m2 (March 2018)

Span length , Bridge Width : Refer Bridge Inventory.

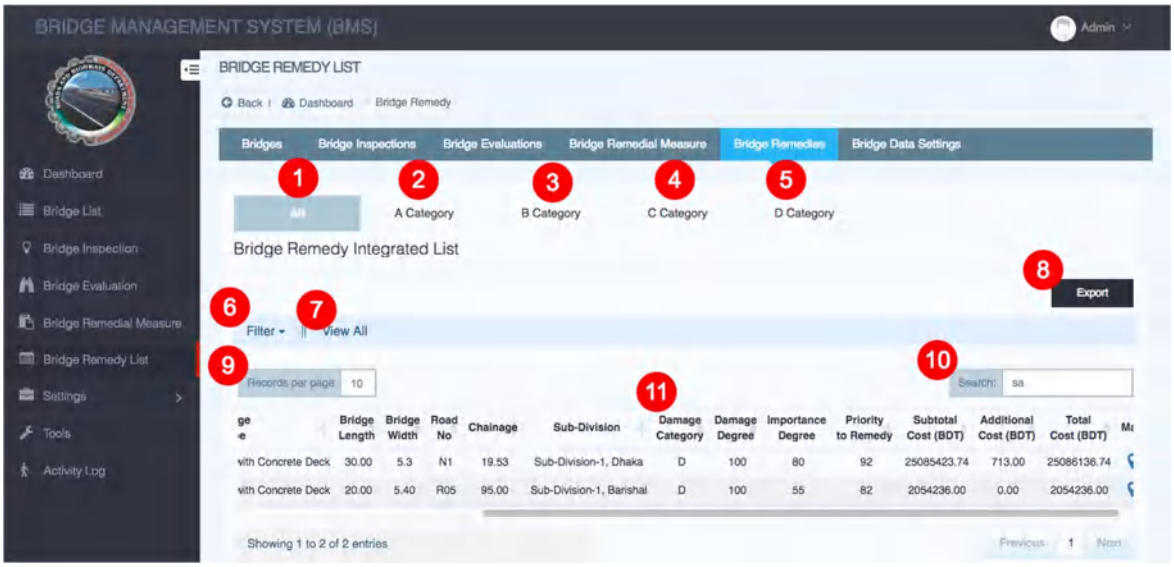
ratio of setting are : User (mainly Evaluator) considers required area of scaffold to carry out remedy construction like as "all span length", "1/2 of span length" or "1/4 span length".

,

For example of Scaffold

5.8 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.

5.9 Data Analysis with Exported Data

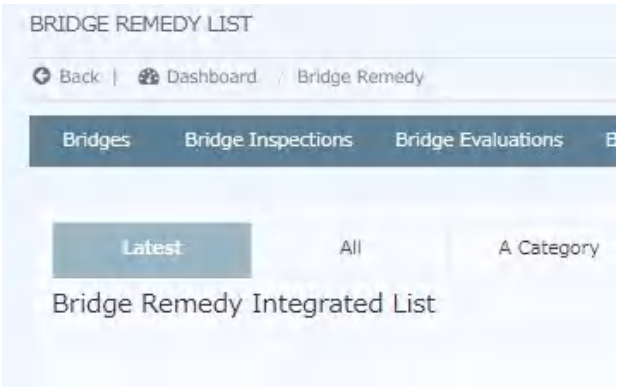
In order to create Annual Needs report based on output of BMS, user can use "Excel sheet for annual report.xls". User can download the excel file from link at top of Dashboard.

(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.

6. 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.

6.1 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".

6.2 Input and Browsing of Inspection Result : Bridge Inspection

6.2.1. Preparation to input Inspection Result.

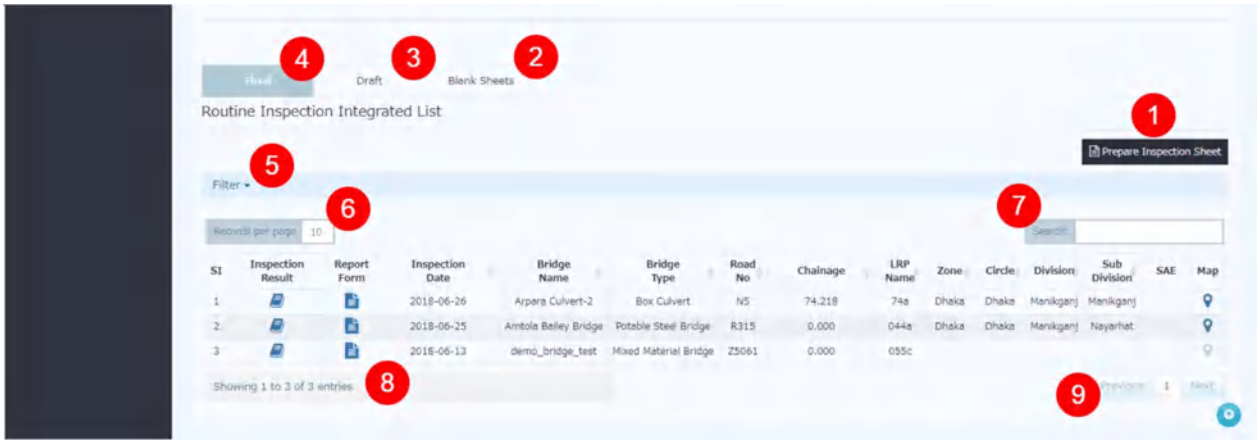
Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Evaluator	Chief Insp.	Public

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

6.2.2. 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 I[illegible] page.

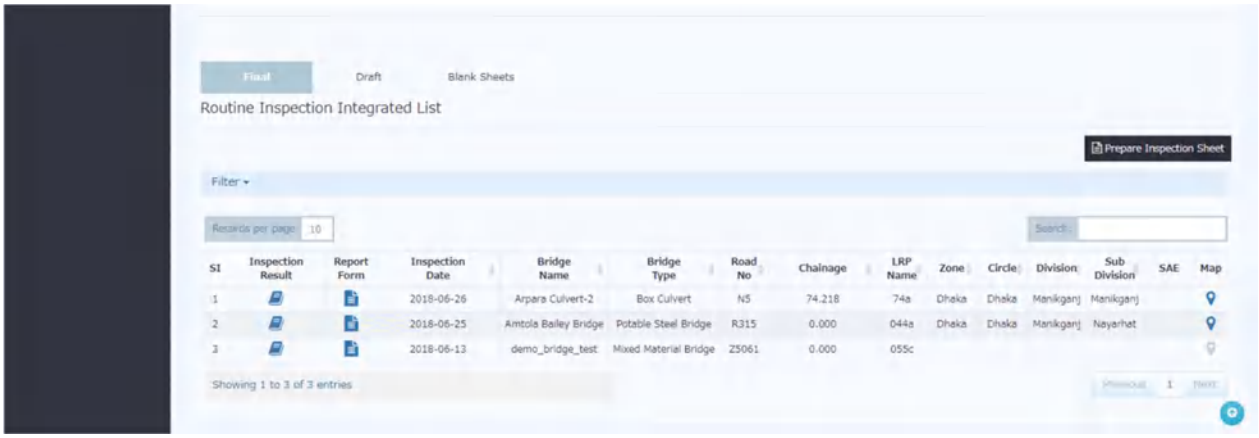


1. Click **"Prepare Inspection Sheet",** Select "Routine" and click create.
2. Click **"Blank Sheets"** to view all blank inspection sheets.
3. Click **"Draft"** to view all draft inspection sheets.
4. Click **"Final"** to view all inspection sheets approved and signed.
5. Click **"Filter"** to filter 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.

6.2.3. 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”.

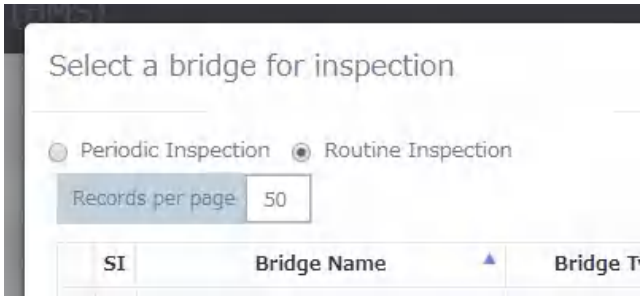
(b) Choose “Targeted Bridge” in Routine Inspection Integrated List and click “Inspection Form”.

(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	RIS-Z1029-005c-20180728			Inspector	Admin	Date	2018-07-28	
Zone	Mymensingh	Circle	Jamalpur	Division	Sherpur	Sub-Division		Sherpur -1
Road No.	Z1029	Road Name	unknown			GPS	Lat	89° 59' 59"
							Long	12° 59' 59"
Bridge Name	Adibori 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					
• Accumulation of debris					
• Abnormal anchorage					
• Abnormal deflection					
• Deformation /break					
9 Drainage system					
• Material Defects*					
• Water leakage					
• Deformation /break					
• Accumulation of debris					

Material *	Defects description
Concrete	Crack, spalling/exposed rebar, waterleakage/efflorescense, 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.

7. 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.

7.1 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.

7.2 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.

7.3 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.

8. TECHNICAL NOTE

8.1 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

Damage Degree (max: 100pt)

= Damage degree of Superstructure (max: 100pt) x Impact of Superstructure (= 0.5)

\+ Damage degree of Substructure (max: 100pt) x Impact of Superstructure (= 0.3)

\+ Damage degree of Bearings (max: 20pt) x Impact of Superstructure (= 0.2)

2) Bridge Type without Bearings

Damage Degree (max: 100pt)

= Damage degree of Superstructure (max: 100pt) x Impact of Superstructure (= 0.6)

\+ Damage degree of Substructure (max: 100pt) x Impact of Superstructure (= 0.4)

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).

Damage degree of Superstructure
Damage degree of Substructure
Damage degree of Bearings

= Impact level x Evaluated degree (At=0, Bt=33, Ct=67, Dt=100)

x Weight coefficient of the element x Weight coefficient of the defect

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")

Damage Degree of superstructure in first span =

Impact level of Component superstructure Xdd = 0.50 x

0.5 x
{1.00 x 0.50 x 33+
0.80 x 0.75 x 67 }
= 0.5 x (16.5+40.2) = 28 pt

{ Coefficient of Element Main Girder x1.00 x Coefficient of Type of defect Corrosion x0.50 x Evaluated degree Bt 33 pt +

Coefficient of Element RC Slab x0.80 x Coefficient of Type of defect Crack of Slab x0.75 x Evaluated degree Ct 67 pt }

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)

1) 0.50 x 1.00 x 0.60 x

Component	Max pt	Impact	Element Types	weight	Span No.	Defect	weight	Evaluated degree	Damage degree	Total 1	Total 2	Total 3
Super-structure	50	0.50	Main girder	1.00	1	Corrosion	0.60	C → 67	21	25	Sp1>S 25>10 25	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	40
					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	12		
					2	Cracks	0.75	B → 33	10	10		
Sub-structure	30	0.30	Abutmenet	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	30
						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 46pt + 21pt + 20pt = 87pt

	Weight Coefficient of Element (A)		Weight Coefficient of Defects (B)		Converted Evaluated Score (C)		Damage Point (A)x(B)x(C)	
SUPERSTRUCTURE	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							

	Weight Coefficient of Element (A)		Weight Coefficient of Defects (B)		Converted Evaluated Score (C)		Damage Point (A)x(B)x(C)	
SUBSTRUCTURE	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	(D)
	Total Damage point of Substructure				Y_{dd} =	0.30	21	Y_{dd} x (D)
	Maximam point = Y_{dd} x 100 = 30 > 21 ok							

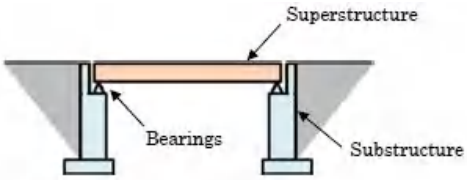
	Weight Coefficient of Element (A)		Weight Coefficient of Defects (B)		Converted Evaluated Score (C)		Damage Point (A)x(B)x(C)	
BEARING	Bearing	1.00	Corrosion	0.25	Bt	33	8.25	
		1.00	Crack	1.00	Bt	33	33.00	
		1.00	Missing bolt	0.50	Bt	33	16.50	
		1.00	Fracture	1.00	Bt	33	33.00	
		1.00	Paint system	0.25	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)

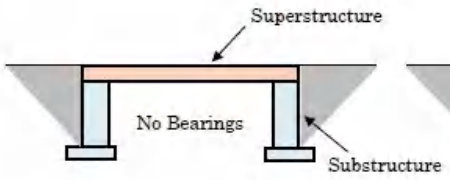
Component	Impact level *)	Details
Superstructure	0.5	This damage directly impacts bridge function.
Substructure	0.3	Compared to superstructure, the impact of this damage to bridge function is not great as the size of the structure is large.
Bearings	0.2	The impact of this damage to bridge function is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



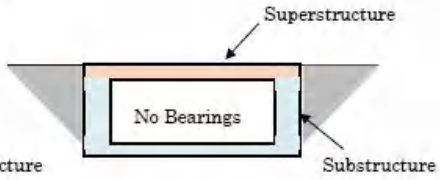
RC/PC Girder Bridge, Steel Girder Bridge

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.Deteriorasion of Paint	0.17
21.Abnormal Noise / Vibration	0.17
23.Deformation / Break	0.17

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

【Deck - Concrete】

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

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

【Main Girder - Steel】

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

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

【Main Girder - Concrete】

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

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

【Cross Beam - Steel】

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

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

【Cross Beam - Concrete】

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

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

Weight Coefficient by type of defects (Substructure)

----- **Substructure** -----

【Abutment / Pier - Steel】

Type of defects	Weight coefficient
1.Corrosion	0.60
2.Crack in Steel	1.00
3.Loose or Missing Bolts	0.20
4.Fracture	1.00
5.Deteriorasion 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.Discolorlation / Deterioration of Material	0.14
20.Water Leakage / Puddle	0.14
23.Deformation / Break of Structure Element	0.14

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

【Foundation】

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

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

Weight Coefficient by type of defects (Bearing)

----- Bearings -----

【Bearing - Steel】

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

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

【Bearing - Rubber】

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

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

【Bearing Seat/Bed - Concrete】

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

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

8.2 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**

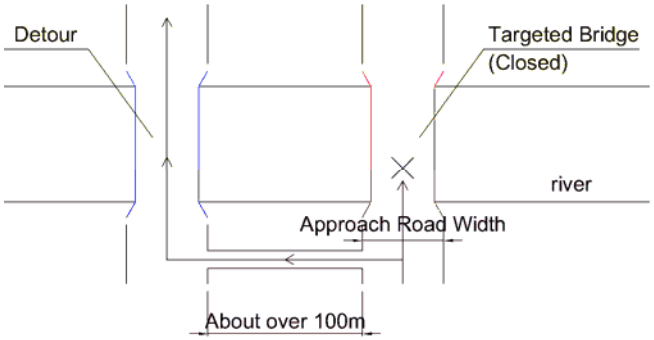
  e.g.

  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

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

8.3 How to calculate Priority to Remedy

Priority Remedy is calculated by following formula.

Priority to Remedy (max: 100pt)

= Damage degree (max: 100pt) x Impact X (= 0.6)

\+ Importance Degree (max: 100pt) x Impact Y (= 0.4)

In the future, above Impact X and Y should be arranged to fit Bangladesh situation.
System manager can arrange them by editing source code,

8.4 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

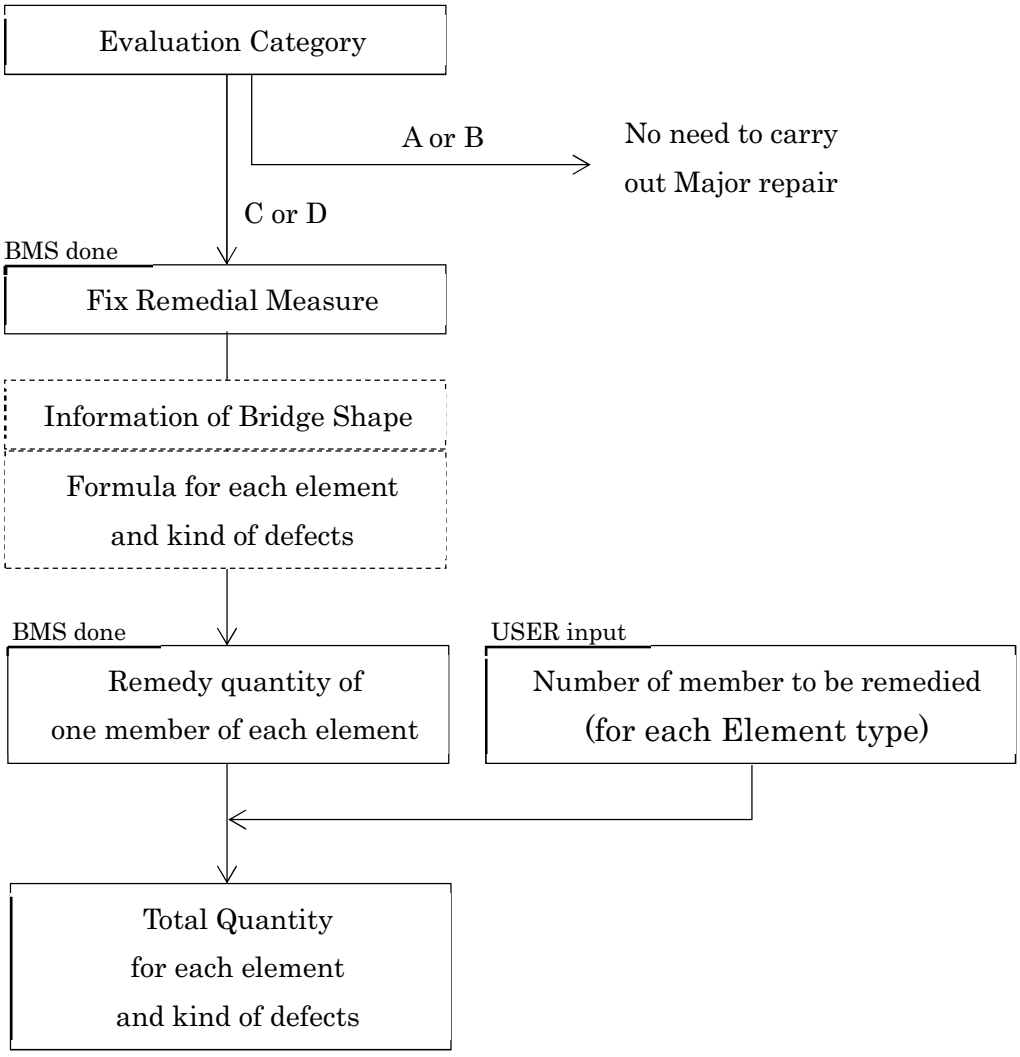
Some of combination of defect and element don't have remedy measure because of following reason,

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

8.5 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 (m^2) 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.

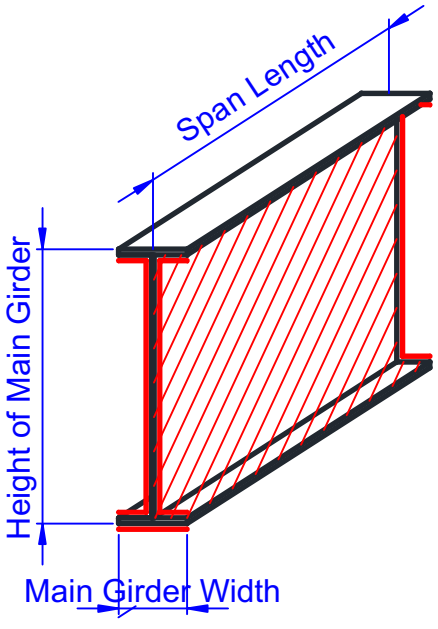
e.g.1 Repainting of Steel I-Girder

- 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



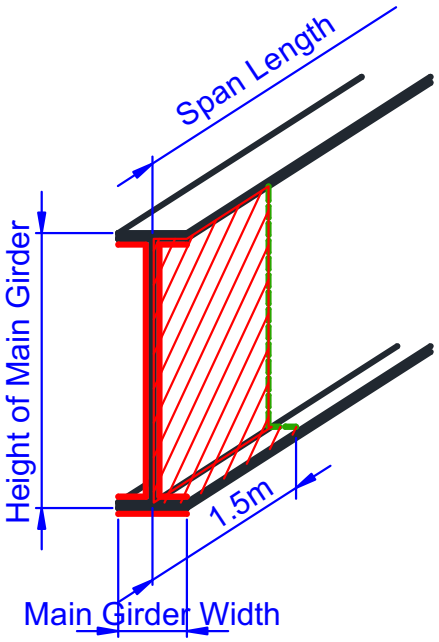
e.g.2 Supplementing Steel Plate of Steel I-Girder

- 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)

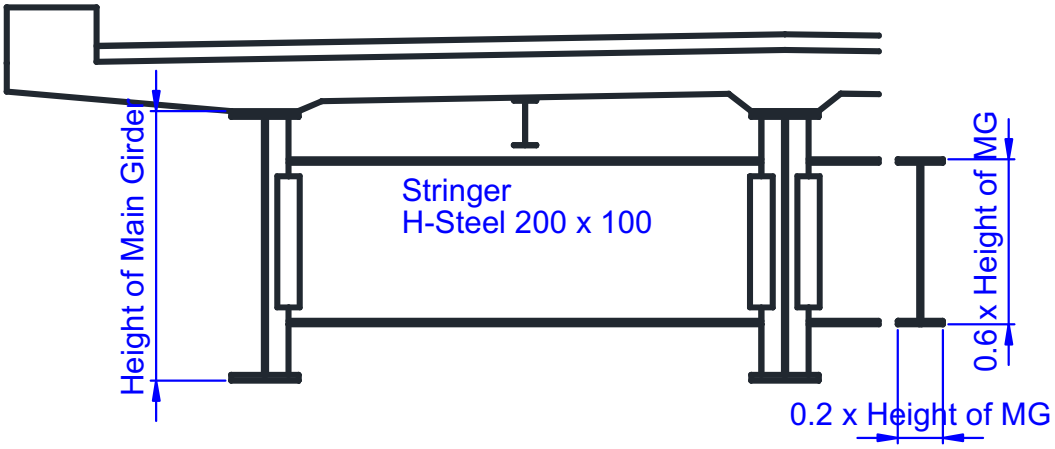
: Basic Formula 209



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

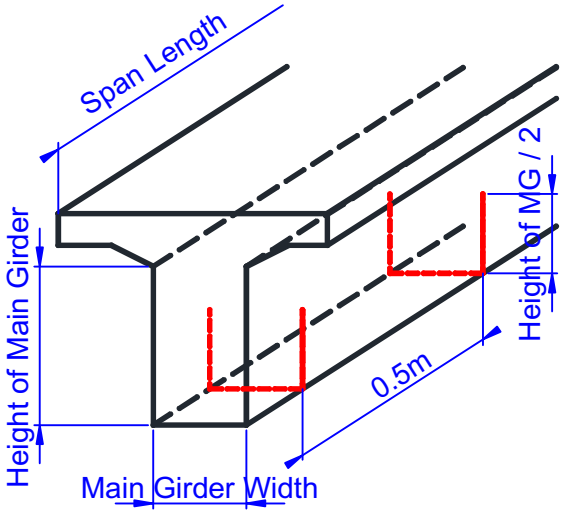
Area to be remedied of steel cross beam or steel stringer is calculated based on following rule.

- 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"



(Width + Height/2x2) x Span/0.5m

→

2.0 x ← coefficient

(MG Width x1 + Height of MG x1) x Span Length

: Basic Formula 205

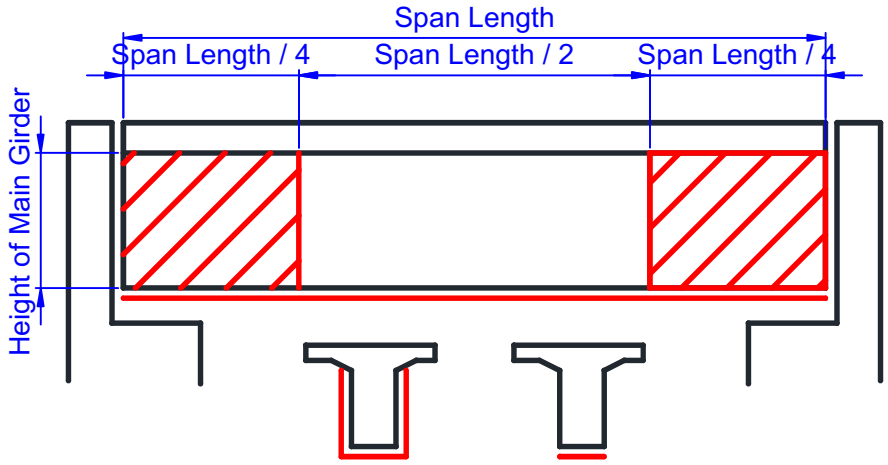
e.g.5 CFS Bonding of Concrete Girder

- 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

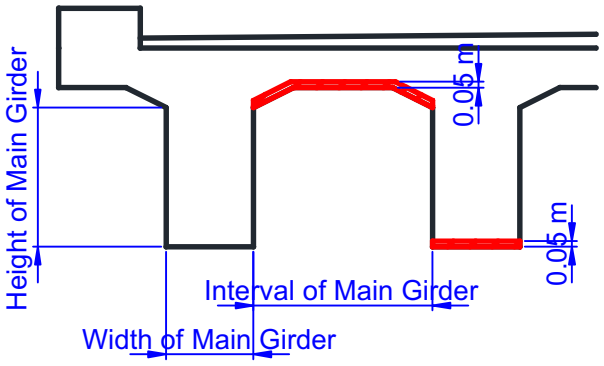
: Basic Formula 204

For Concrete Deck Slab

0.05 x ← coefficient

Interval of MG x Span Length

: Basic Formula 202



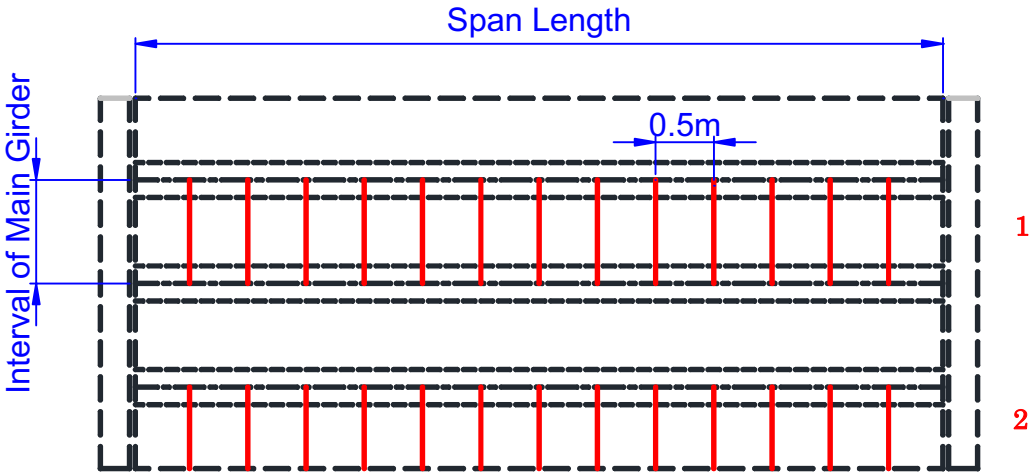
e.g.7 Crack Injection of Concrete Deck Slab

- 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

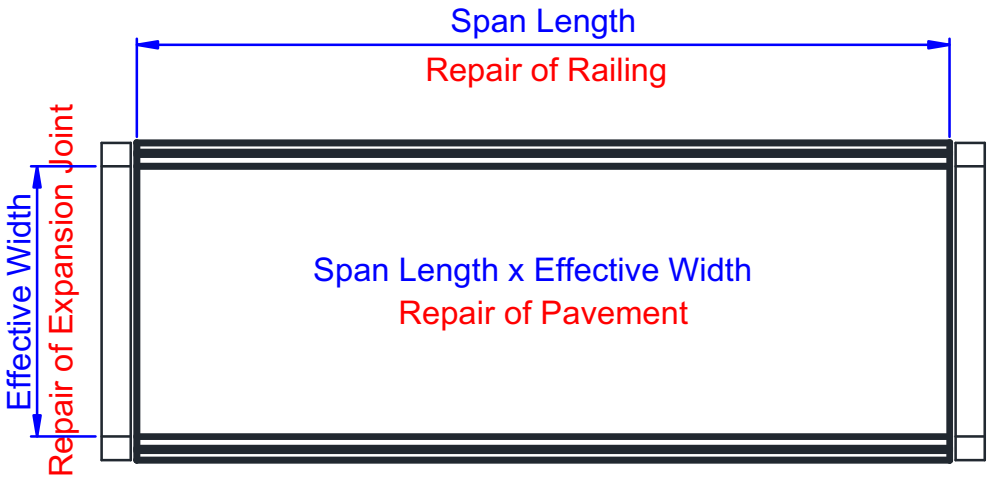


*Red line is crack of deck slab.

e.g. In case of above drawing,

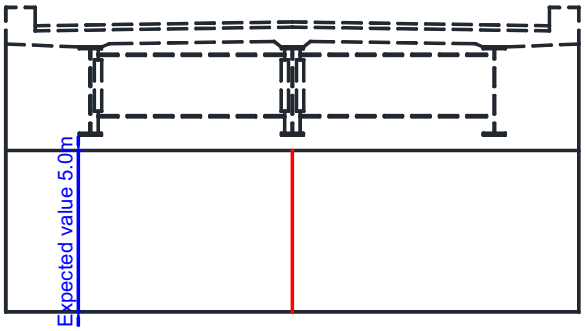
Number of element (to be remedied) in Bridge Remedial Measure is "2".

e.g.8 Other Remedial Measure of Superstructure



e.g.9 Crack of Abutment

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



5.0 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

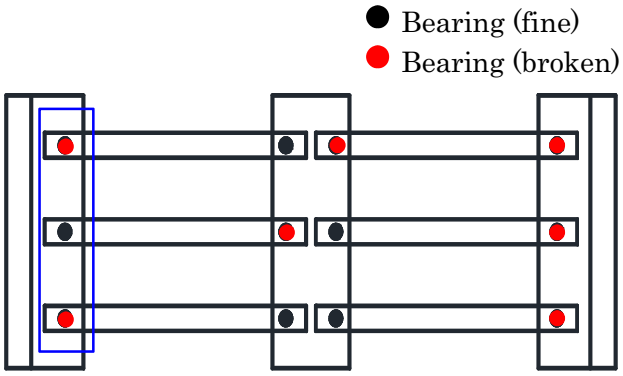
- No. of Bearings per each line

  (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]

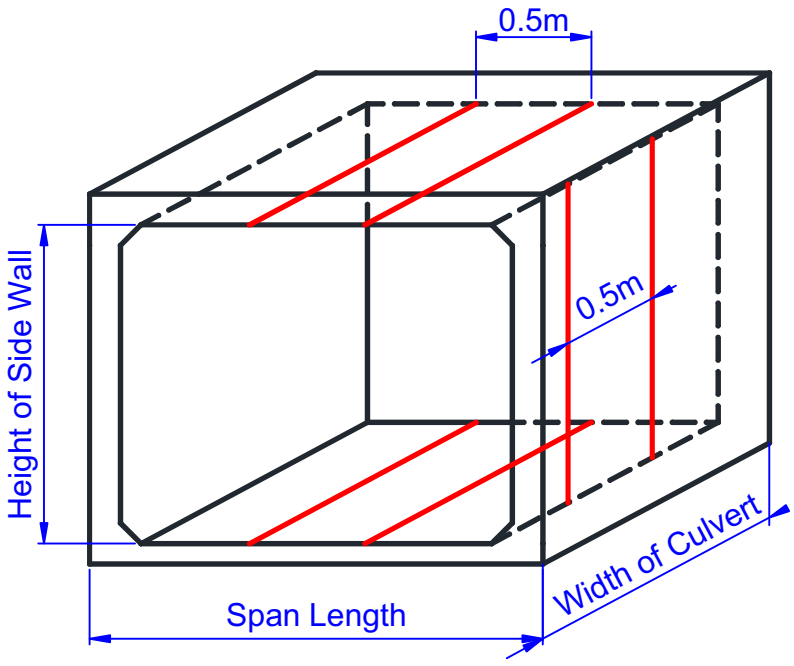
2.0 x ← coefficient

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



A P P E N D I X

Aug 2018

A P P E N D I X

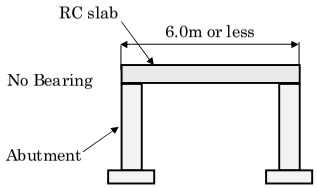
BASIC KNOWLEDGE OF BRIDGE

Bridge and Culvert Type

<Concrete Bridge >

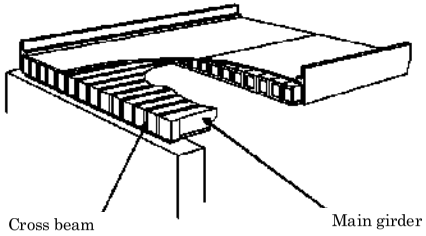
1. Small Slab Bridge (Former "Slab Culvert")

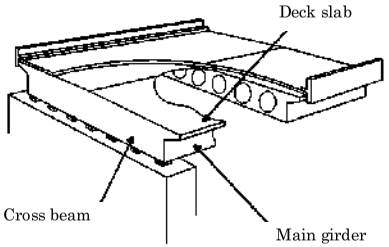
A structure comprising a slab(s) without girders supported on abutments/piers and having a length of 6.0m or less measured at right angles between the extreme vent way boundaries.



2. RC Slab Bridge

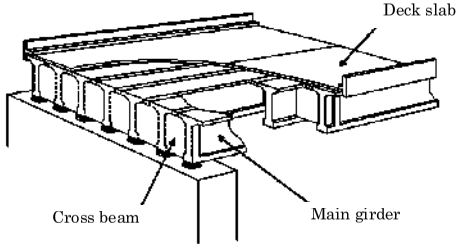
In general, the span is less than 16m





3. RC Girder Bridge

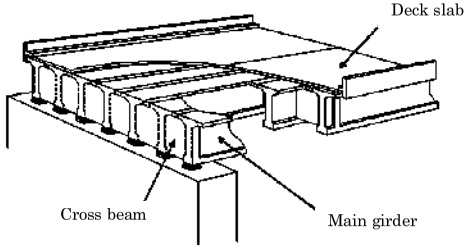
In general, the span is less than 20m. In special case It can be less than 30m



Bhuvagati Bridge in SirajGanj

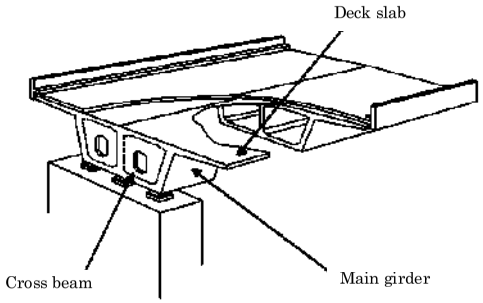
4. PC Girder Bridge

In general, the span is more than 20m



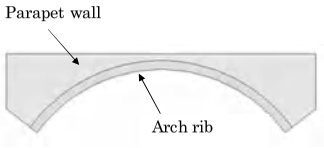
Kanchpur Bridge in Narayanganj

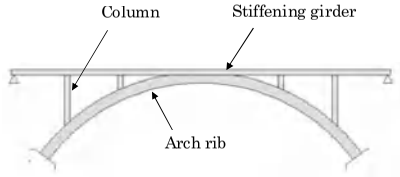
5. PC Box Girder Bridge

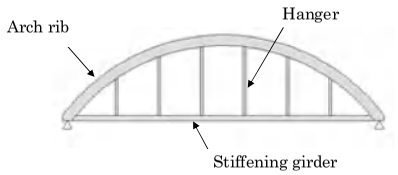


Rupsha Bridge

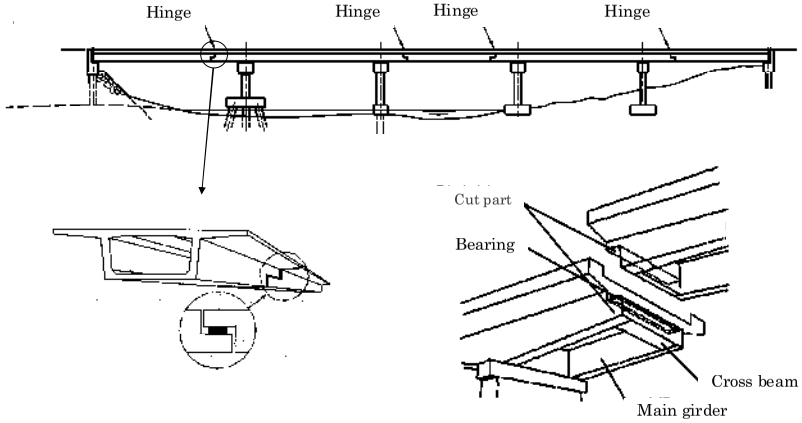
6. Concrete Arch Bridge



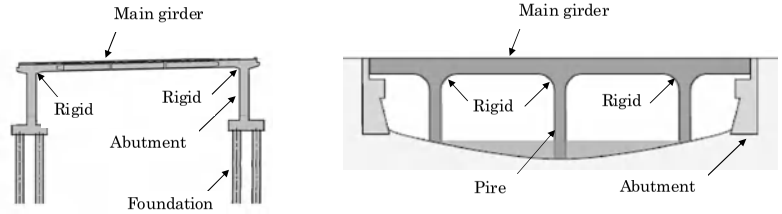




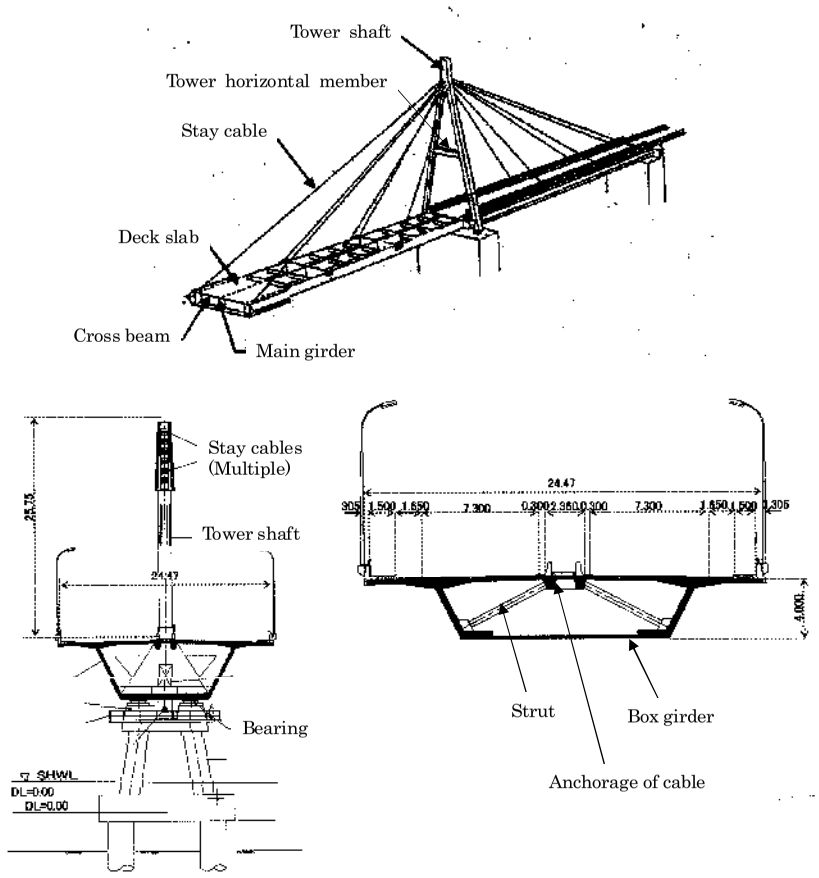
7. Cantilever Bridge with Hinge



8. Rigid Frame Bridge



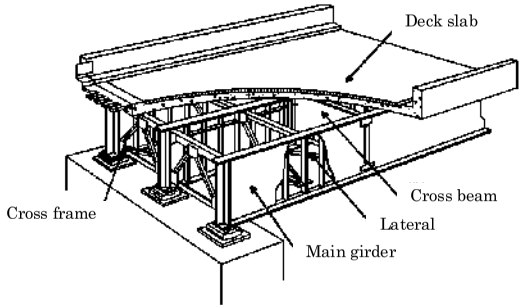
9.Cable- Stayed Bridge



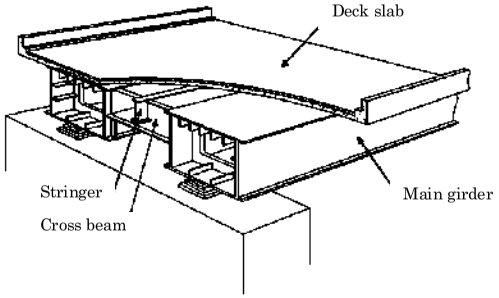
Section and elements of the 3rd Kamaphuli Bridge (Extradosed bridge)

< Steel Bridge >

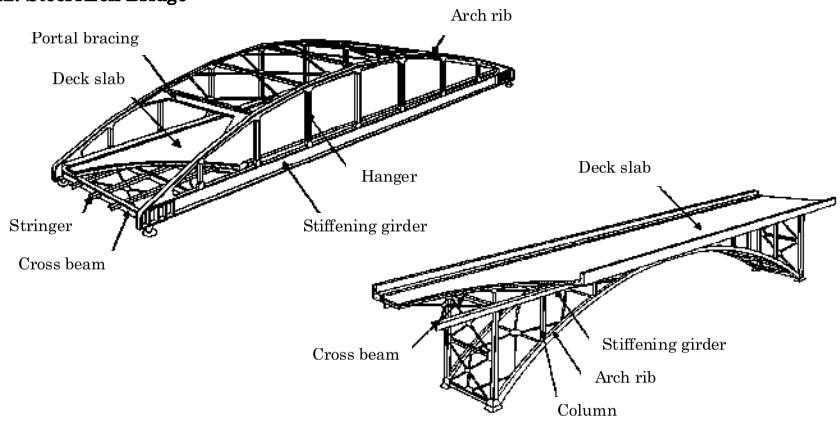
10. Steel Girder Bridge



11. Steel Box Girder Bridge



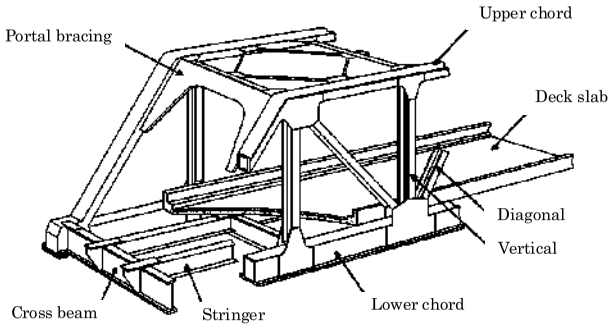
12. Steel Arch Bridge



13. Truss Bridge with Steel Deck

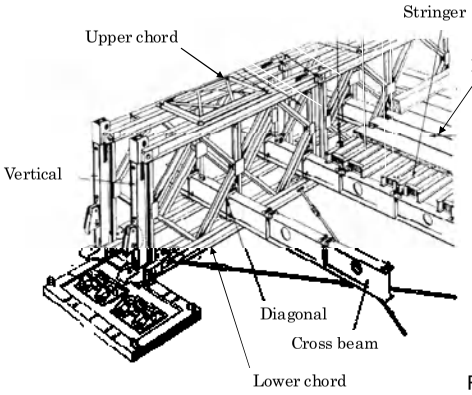
14. Truss Bridge with RC slab

15. Truss Bridge with Timber Deck



16. Portable Steel Bridge with Steel Deck

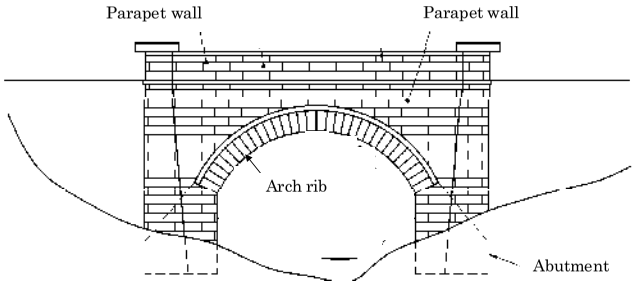
17. Portable Steel Bridge with Timber Deck



Rodal Tlki Portable Steel Bridge in Manikganj

< Masonry Arch Bridge >

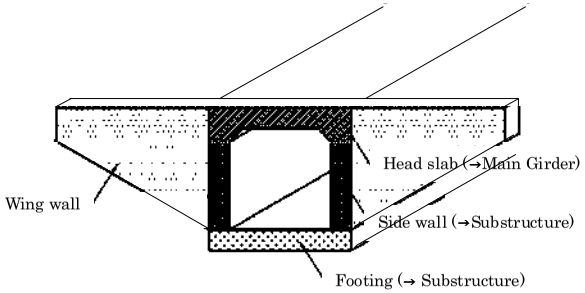
18. Masonry Arch Bridge



< Culvert >

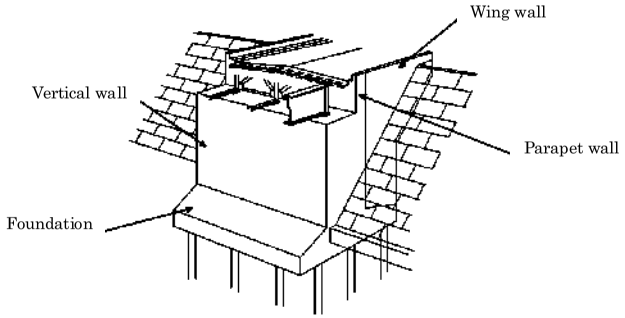
19. Box Culvert

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.

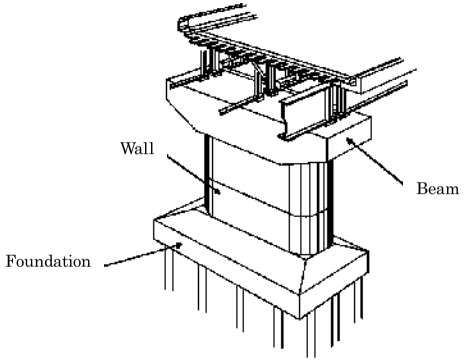


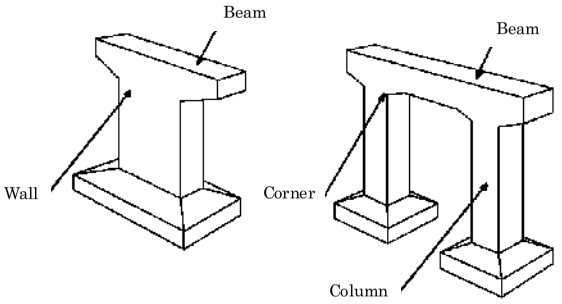
Substructure Type

<Abutment>

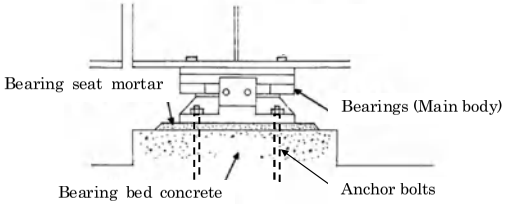


<Pier>



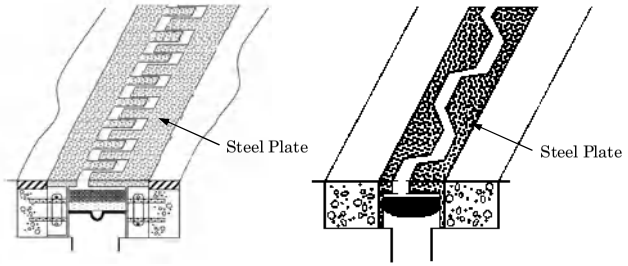


Bearings

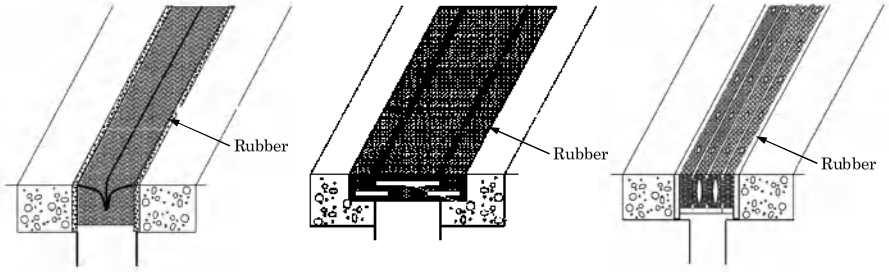


Expansion Joint

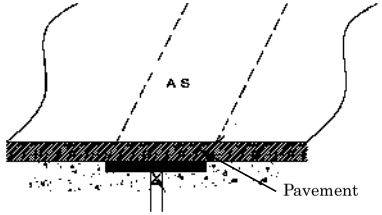
<Steel>



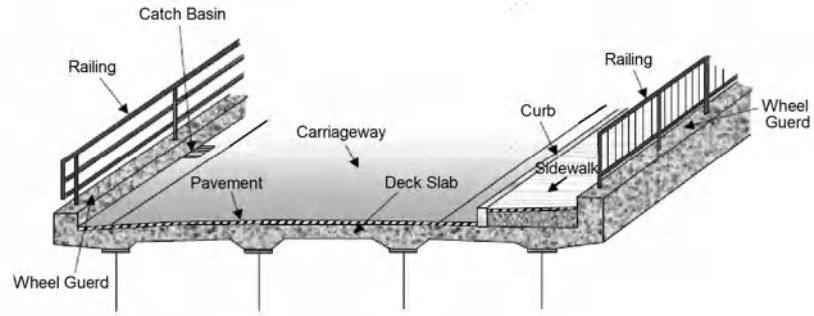
<Rubber>

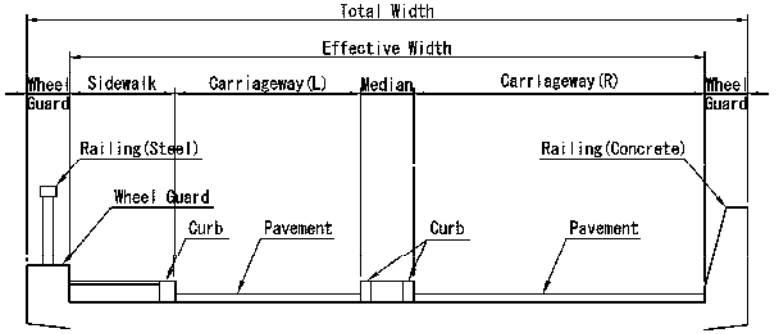


<Others>



Deck Surface





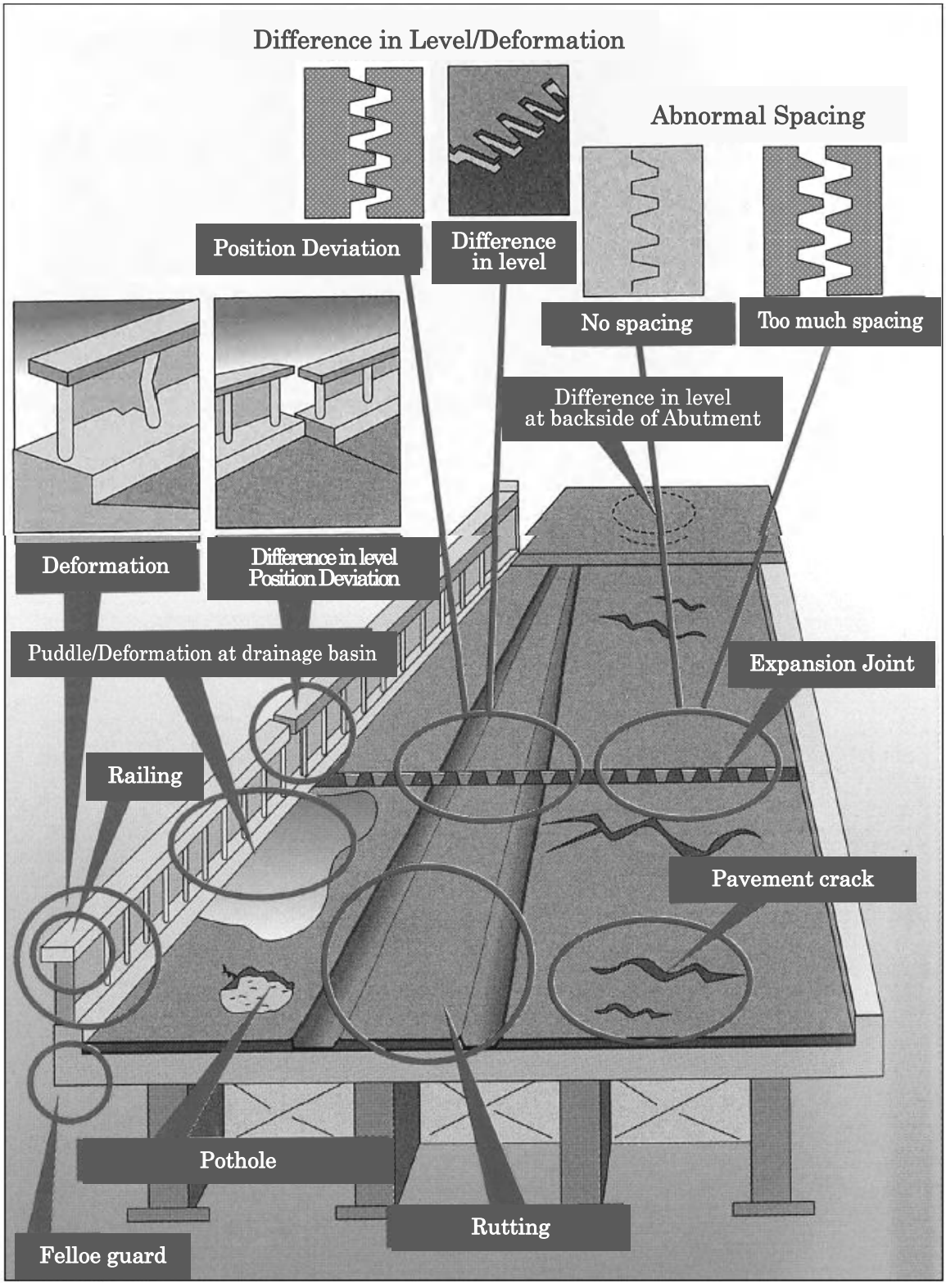


Figure Summary of Possible Defects and Locations

A P P E N D I X

RECORDING OF INVENTORY AND RESULT

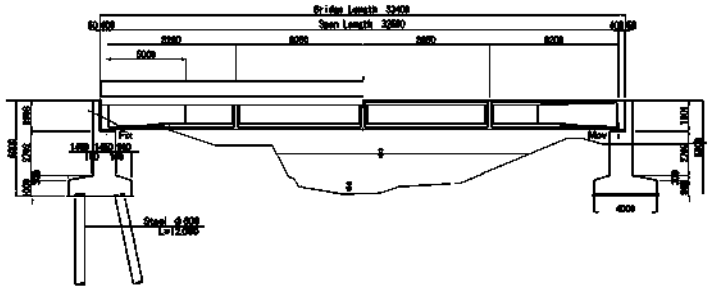
Periodic Inspection/Evaluation Report Form (Sample)

File Number	N1, 8b			Inspector		Date	
Zone	Dhaka	Circle	Dhaka	Division	Narayangnj-1	Sub-Division	Narayangnj-1
District		Upazilla		Union		Village	
Road No.	N1	Road Name	Dhaka(Jatrabari)-Comilla-Chittagong-Taknaf	LRP Name	8b	GPS Lat	23d-42'-7.5"
						GPS Long	90d-30'-57.3"
Bridge Name	Yamato Bridge		LRP+Offset (m)	5+3976		Chainage (km)	8.976
Year of Construction	1972	Design Standard		Design Load	TL-20	Load Ristriction	(ton)
Feature Intersected	River	Owner		Public Utilities Carried	telephone line	Owner	
	Road	Owner			water	Owner	
	Railway	Owner					
Bridge Length	33.4	No. of Spans	1	Span Arrangement	33.4	Skew Angle (degree)	85

		Type	Material		Type	Material
Superstructure		PC Girder Br	Concrete	Deck Slab	RC	Concrete
Substructure	Abutment	Semi-Gravity type	Concrete	Foundation (Abutment)	Pile Foundation	Steel
	Pier	---		Foundation (Pier)	---	
Other Elements	Pavement	Asphalt		Bearings	Rubber	
	Expansion Joint	Steel		Railing	Others	

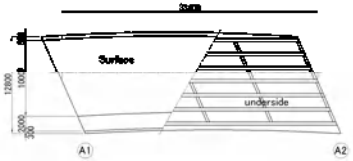
Width	Total Width	12.8 m	Wheel Guard-L	Sidewalk-L	Carriage way-L	Median	Carriage way-R	Sidewalk-R	Wheel Guard-R
	Effective Width	12.0 m	0.5 m	0.0 m	5.5 m	4.5 m	2.0 m	0.3 m	0.0 m
Traffic Conditions	Census (year)	2014				Heavy Vehicle Traffic Rate (%)		0~10・10~20・20~30・30~	
	Traffic Volume	10,500 Vehicles (Daytime 12 hours)				Condition Category for Entire Bridge		85	D

General View

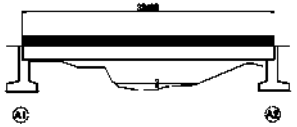


General View of the Span

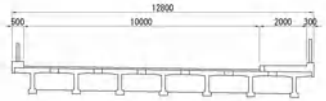
Plan



Side View



Cross Section



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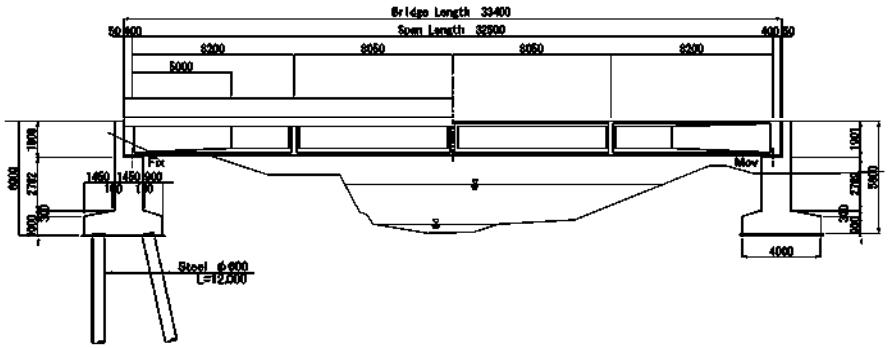
Page No.11 of Appendix

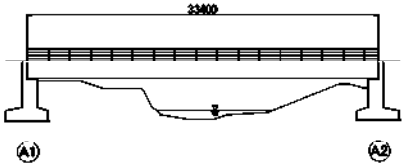
General Drawings

Bridge Number		Bridge Name	Yamato Bridge	Route Name	

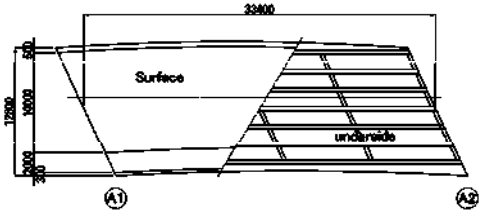
General View



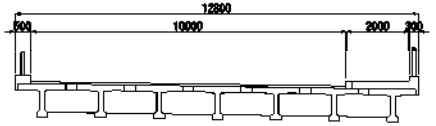
Side View



Plan



Cross Section



Overall View Photo

Bridge Number		Bridge Name	Yamato Bridge	Route Name	

Viewpoint	Side View
Date	

Viewpoint	Front View
Date	

Viewpoint	Under Bridge
Date	

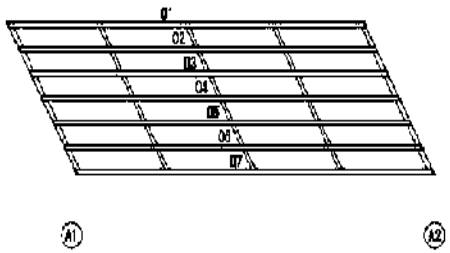
Sample of PC Bridge

Element Numbering System

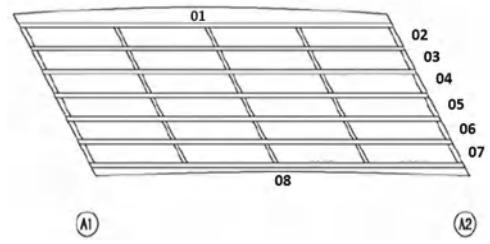
Bridge Number		Bridge Name	Yamato Bridge	Route Name	

Span No.	1

Main Girder (Mg)

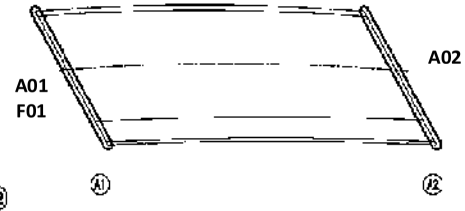


Deck Slab (Ds)

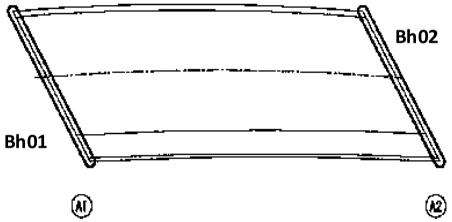


Cross Girder (Cr)

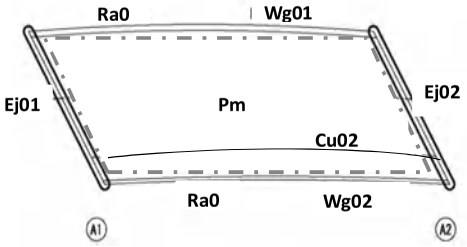
Substructure
Abutment (A), Foundation (F)



Bearings (Bh)



Railing (Ra), Wheel Guard (Wg)
Expansion Joint (Ej), Curb (Cb), Pavement (Pm)

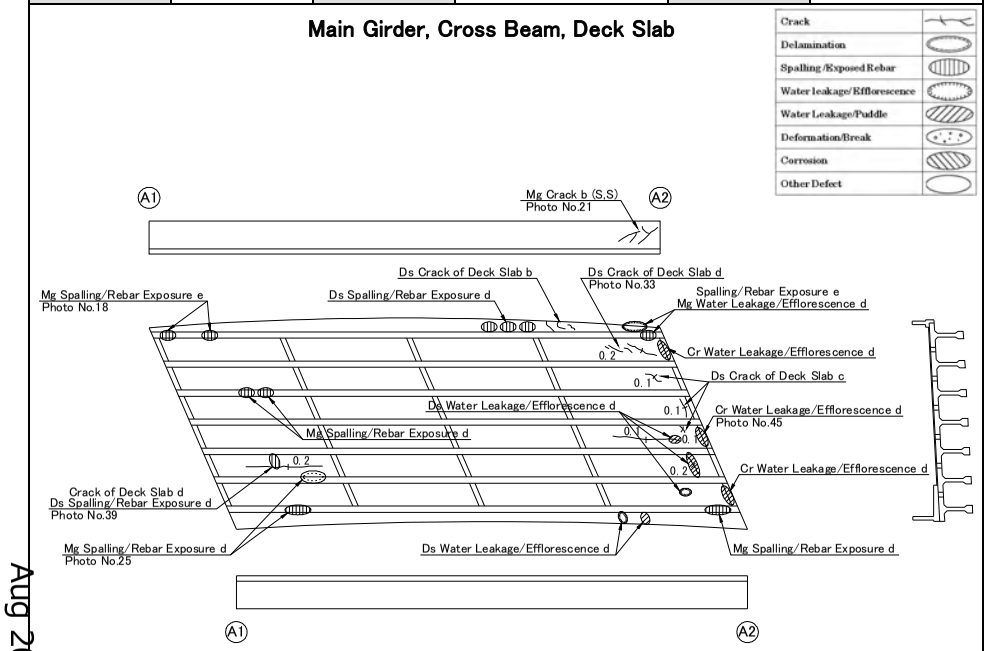


Sample of PC Bridge

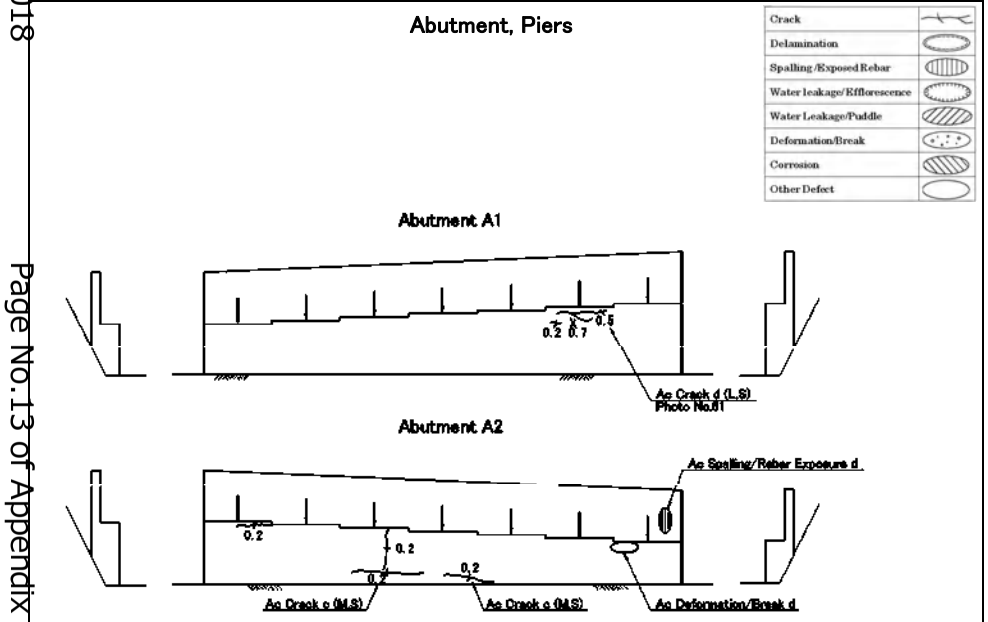
Defect Sketch

Bridge Number		Bridge Name	Yamato Bridge	Route Name	

Main Girder, Cross Beam, Deck Slab



Abutment, Piers



Defect Photos

Bridge Number		Bridge Name	Yamato Bridge	Route Name	

Span No.	1	Photo No.	18	Span No.	1	Photo No.	21
Element	Main Girder	Defect	Spalling/Rebar Exposure	Element	Main Girder	Defect	Crack
		Rating	e			Rating	b

Span No.	1	Photo No.	25	Span No.	1	Photo No.	45
Element	Main Girder	Defect	Spalling/Rebar Exposure	Element	Cross Beam	Defect	Leakage/Efflorescence
		Rating	d			Rating	d

Span No.	1	Photo No.	33	Span No.	1	Photo No.	39
Element	Deck Slab	Defect	Crack of Deck Slab	Element	Deck Slab	Defect	Spalling/Rebar Exposure
		Rating	d			Rating	d

Periodic Inspection Report Form

Inspector Date

File Number		Bridge Name	Yamato Bridge	Superstructure	.PC Girder Bridge	Year	1972
Zone		Circle		Division		Sub-Division	
Survey Result				No. of Hinge	0	Span Length	33.4 m	Span No.	1

Items of Defects		Steel Material					Concrete Material						Others				Common									Remarks
		Corrosion	Crack	Loose or Missing Bolts	Fracture	Deterioration of Paint System	Crack	Spalling/Exposed Rebar	Water Leakage/Efflorescence	Fallen out of Deck Slab	Crack of Deck Slab	Delamination	Abnormal Spacing	Difference in Level	Pavement Crack	Functional disorder of Bearings	Others	Defects of Reinforced Materials	Abnormal Anchorage	Discoloration/deterioration	Water Leakage /Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Deformation/Break	Accumulation of Debris	Settlement/Tilt/Movement	Scour	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
Main Girder	01						b	e	c																			
Main Girder	02																											
Main Girder	03							d																				
Main Girder	04																											
Main Girder	05																											
Main Girder	06						b	c																				
Main Girder	07							d	d																			
Cross Beam	01								d																			
Cross Beam	02																											
Cross Beam	03																											
Cross Beam	04								d																			
Cross Beam	05																											
Cross Beam	06								d																			
Deck Slab (RC)	01							d			b																	
Deck Slab (RC)	02										d																	
Deck Slab (RC)	03										c																	
Deck Slab (RC)	04										c																	
Deck Slab (RC)	05								d		c																	
Deck Slab (RC)	06							d	d		d																	
Deck Slab (RC)	07								d																			
Deck Slab (RC)	08								d																			
Abutment	01						d	d																				
Abutment	02						c																	c				
Foundation (RC)	01																											
Foundation (RC)	02																											
Bearing	01	d																			e							
Bearing	02	d																			e							
Expansion Joint (Rubber)	01																				e							
Railing (Steel)	01																											
Wheel Gurad	01																							c				
Drainage System	01	c																							e			
Pavement	01													e														
Bridge Approaches	01																											
Bridge Approaches	02																											
Lighting Facility	01																											
Utility Pipe	01																							c				
Summary and Recommendation																												

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Bridge Evaluation Report Form

Evaluator Date

File Number		Bridge Name	Yamato Bridge	Superstructure	PC Girder Bridge	Year	1972
Zone		Circle		Division		Sub-Division	
Evaluation Result						Span No.	1	Page No.	1/3

Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Superstructure	Main Girder, Main Truss, Main Arch, Outer Cable, Main Tower, Arch Rib, Top Slab, * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack	✔						
			7.Spalling / Exposed Rebar			✔				
			8.Water leakage /Efflorescence		✔					
			11.Delamination	✔						
		Others	12.Abnormal Spacing	✔						
			16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material	✔						
			18.Abnormal Anchorage	✔						
			19.Discolorlation / Deterioration	✔						
			20.Water Leakage / Puddle	✔						
			21.Abnormal Noise / Vibration	✔						
			22.Abnormal Deflection	✔						
			23.Deformation / Break	✔						
	Cross Beam, Stringer, * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack	✔						
			7.Spalling / Exposed Rebar	✔						
			8.Water leakage /Efflorescence		✔					
			11.Delamination	✔						
		Others	16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material							
			18.Abnormal Anchorage	✔						
			19.Discolorlation / Deterioration	✔						
			21.Abnormal Noise / Vibration	✔						
			22.Abnormal Deflection							
			23.Deformation / Break	✔						
	Lateral Bracing, - Secondary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			21.Abnormal Noise / Vibration							
			23.Deformation / Break							
	Deck Slab, * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	7.Spalling / Exposed Rebar		✔					
			8.Water leakage /Efflorescence		✔					
			9.Fallen out of Deck Slab	✔						
			10.Crack of Deck Slab			✔				
			11.Delamination	✔						
		Others	16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material							
			18.Abnormal Anchorage	✔						
			19.Discolorlation / Deterioration	✔						
			20.Water Leakage / Puddle	✔						
			23.Deformation / Break	✔						

Bridge Evaluation Report Form

Evaluator: Date:

File Number		Bridge Name	Yamato Bridge	Superstructure	PC Girder Bridge	Year	1972
Zone		Circle		Division		Sub-Division	
Evaluation Result				Span No.	1	Page No.	2/3

Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Substructure	Abutment, Pier, Side Wall, Parapet Wall	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack			✔				
			7.Spalling / Exposed Rebar		✔					
			8.Water leakage /Efflorescence	✔						
			11.Delamination	✔						
		Others	16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material							
			19.Discolorlation / Deterioration	✔						
			20.Water Leakage / Puddle	✔						
			21.Abnormal Noise / Vibration							
	* Primary element		23.Deformation / Break	✔						
	Foundation, Footing	Steel	1.Corrosion							
			2.Crack in Steel							
			5.Deterioration of Paint System							
		Concrete	6.Crack	✔						
			7.Spalling / Exposed Rebar	✔						
		Others	16.Other Types of Defects	✔						
		Common	25.Settelment / Tilt / Movement	✔						
	* Primary element		26.Scouring	✔						
	Retaining Wall	Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			19.Discolorlation / Deterioration							
			23.Deformation / Break							
			25.Settelment / Tilt / Movement							
	- Secondary element		26.Scour							
Bearings	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	✔						
		Others	12.Abnormal Spacing	✔						
			15.Function Disorder of Bearings	✔						
			16.Other Types of Defects	✔						
		Common	20.Water Leakage / Puddle	✔						
			21.Abnormal Noise / Vibration	✔						
			23.Deformation / Break	✔						
			24.Accumulation of Debris	✔						
	* Primary element		25.Settelment / Tilt / Movement	✔						
	Bearing Seat Mortal, Bearing Bed concrete	Concrete	6.Crack	✔						
			7.Spalling / Exposed Rebar	✔						
			11.Delamination	✔						
		Others	16.Other Types of Defects	✔						
		Common	20.Water Leakage / Puddle		✔					
	* Primary element		23.Deformation / Break	✔						

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Sample of PC Bridge

Bridge Evaluation Report Form

Evaluator: Date:

File Number		Bridge Name	Yamato Bridge	Superstructure	PC Girder Bridge	Year	1972
Zone		Circle		Division		Sub-Division	
Evaluation Result				Span No.	1	Page No.	3/3

Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Pavement	Others	13.Differnce in Level			✔				
		14.Abnormal Bituminous Pavement	✔						
		16.Other Types of Defects	✔						
- Secondary element	Common	24.Accumulation of Debris	✔						
Bridge Approaches	Others	13.Differnce in Level	✔						
		14.Abnormal Bituminous Pavement	✔						
		16.Other Types of Defects	✔						
- Secondary element	Common	24.Accumulation of Debris	✔						
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	✔						
	Concrete	6.Crack							
		11.Delamination							
	Others	12.Abnormal Spacing	✔						
		13.Differnce in Level	✔						
		16.Other Types of Defects	✔						
	Common	20.Water Leakage / Puddle		✔					
		21.Abnormal Noise / Vibration	✔						
		23.Deformation / Break	✔						
- Secondary element		24.Accumulation of Debris	✔						
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	✔						
	Concrete	6.Crack							
		7.Spalling / Exposed Rebar							
		8.Water leakage /Efflorescence							
		11.Delamination							
	Others	16.Other Types of Defects	✔						
	Common	19.Discolorlation / Deterioration		✔					
- Secondary element		23.Deformation / Break	✔						
Drainage System > Including - Catch-Basin - Drainage Pipe	Steel Polyvinyl	1.Corrosion		✔					
		4.Fracture	✔						
		5.Deterioration of Paint System	✔						
	Others	16.Other Types of Defects	✔						
	Common	19.Discolorlation / Deterioration	✔						
		20.Water Leakage / Puddle	✔						
		23.Deformation / Break	✔						
- Secondary element		24.Accumulation of Debris		✔					
Lighting Facility Road Sign Facility	Steel	1.Corrosion	✔						
		2.Crack in Steel	✔						
		3.Loose or Missing Bolts	✔						
		4.Fracture	✔						
		5.Deterioration of Paint System	✔						
	Others	16.Other Types of Defects	✔						
	Common	19.Discolorlation / Deterioration	✔						
- Secondary element		23.Deformation / Break	✔						
Inspection Facility Utility Pipe	Steel	1.Corrosion	✔						
		2.Crack in Steel	✔						
		3.Loose or Missing Bolts	✔						
		4.Fracture	✔						
		5.Deterioration of Paint System	✔						
	Others	16.Other Types of Defects	✔						
	Common	21.Abnormal Noise / Vibration	✔						
- Secondary element		23.Deformation / Break		✔					

Periodic Inspection/Evaluation Report Form (Sample)

File Number				Inspector		Date	
Zone	Rajshahi	Circle	Pabna	Division	Sirajganj	Sub-Division	Sirajganj-1
District		Upazilla		Union		Village	
Road No.	R451	Road Name	Nalka-Sirajganj Road	LRP Name	LRP001	GPS	Lat 24d-25'-47" / Long 89d-36'-4"
Bridge Name	Naiori Bridge	LRP+Offset (m)				Chainage (km)	0.907
Year of Construction	1980	Design Standard		Design Load		Load Ristriction	(ton)
Feature Intersected	River	Owner		Public Utilities Carried	telephone line	Owner	
	Road	Owner			water	Owner	
	Railway	Owner					
Bridge Length	50.08	No. of Spans	2	Span Arrangement	25+25	Skew Angle (degree)	90

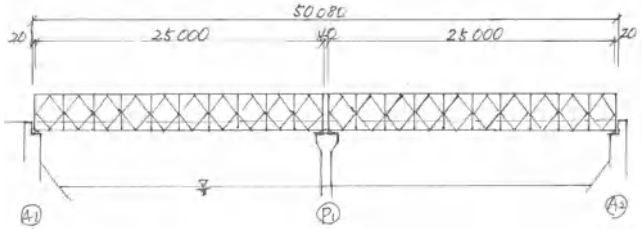
		Type	Material		Type	Material
Superstructure		Portable Steel Bridge with Steel Deck	Steel	Deck Slab	Steel	Steel
Substructure	Abutment	Inverted T-type	Concrete	Foundation (Abutment)	Piled	---
	Pier	Wall Type	Concrete	Foundation (Pier)	Piled	---
Other Elements	Pavement	None		Bearings	Steel	Steel
	Expansion Joint	None		Railing	None	

			Wheel Guard-L	Sidewalk-L	Carriage way-L	Median	Carriage way-R	Sidewalk-R	Wheel Guard-R
Width	Total Width	7.50 m							
	Effective Width	6.05 m	0.1 m	0.0 m	7.30 m	m	0.0 m	0.1 m	0.0 m

Traffic Conditions	Census (year)	Heavy Vehicle Traffic Rate (%)	0~10 ・10~20 ・20~30 ・30~
	Traffic Volume: Vehicles (Daytime 12 hours)	Condition Category for Entire Bridge	35 / B

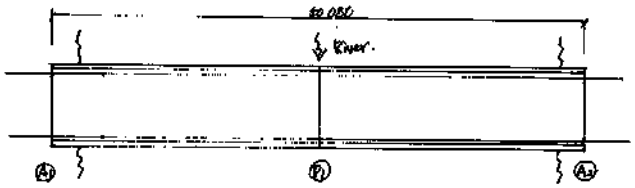
General View

Side View

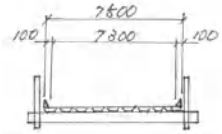


General View of the Span

Plan



Cross Section



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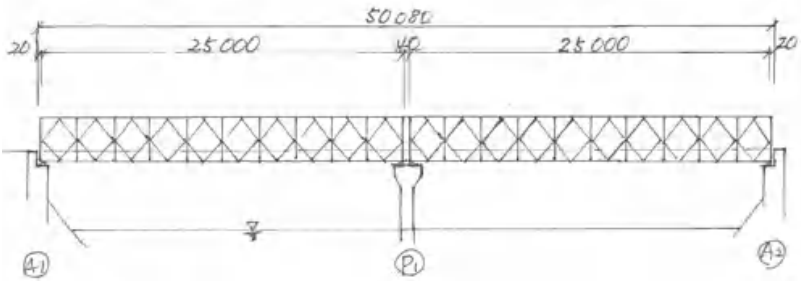
Sample of PSB

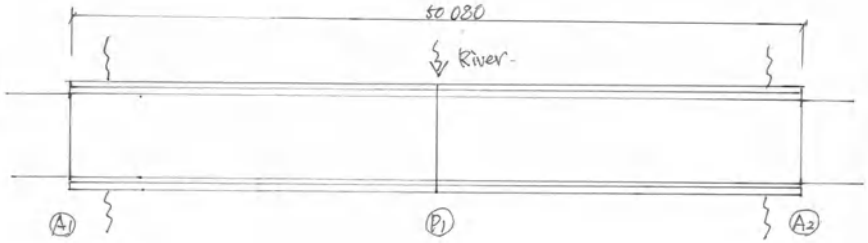
General Drawings

Bridge Number		Bridge Name	Naiori Bridge	Route Name	

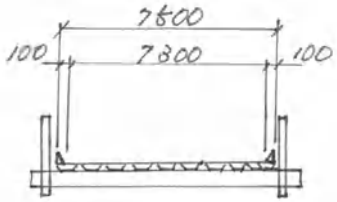
General View



Plan



Cross Section



Overall View Photo

Bridge Number		Bridge Name	Naiori Bridge	Route Name	

Viewpoint	Side View
Date	23.08.15

Viewpoint	Front View
Date	23.08.15

Viewpoint	Under Bridge
Date	23.08.15

Sample of PSB

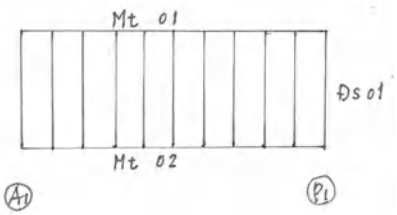
Element Numbering System

Bridge Number		Bridge Name	Naiori Bridge	Route Name	

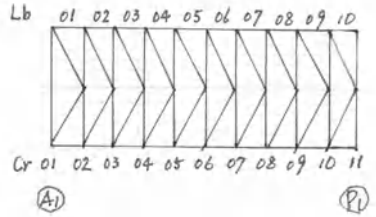
Span No.	1

Main Truss (Mt)

Deck Slab (Ds)

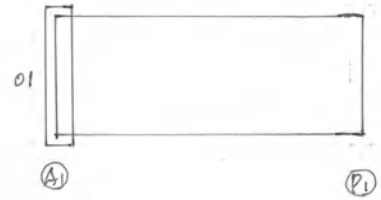


Cross Beam (Cb), Lateral Bracing (Rb)

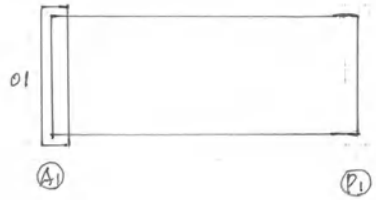


Substructure

Abutment(A) ,Foundation(F)

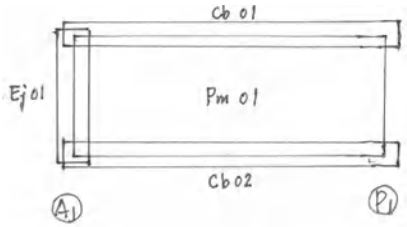


Bearing(Br)



Curb(Cb)

Expansion Joint (Ej), Pavement (Pm)

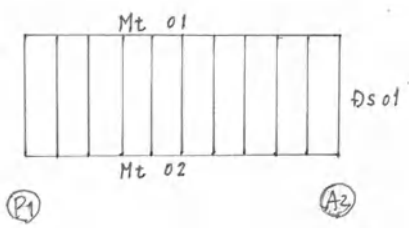


Element Numbering System

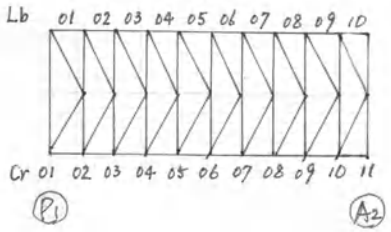
Bridge Number		Bridge Name	Naiori Bridge	Route Name	
				Span No.	2

Main Truss (Mt)

Deck Slab (Ds)



Cross Beam (Cb), Lateral Bracing (Rb)



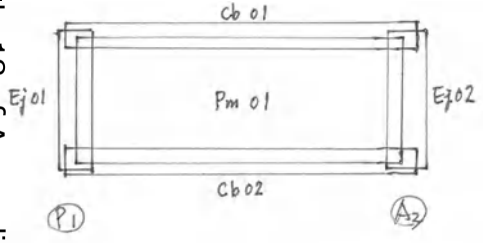
Substructure

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

Bearing(Br)

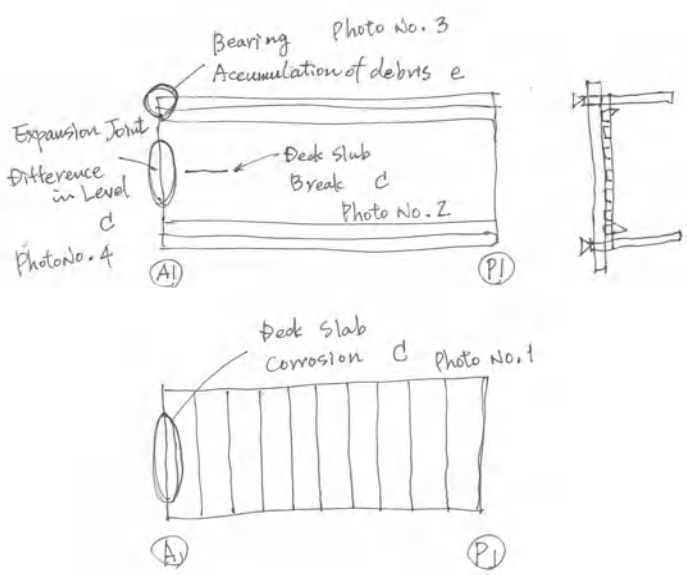
Curb(Cb)

Expansion Joint (Ej), Pavement (Pm)



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

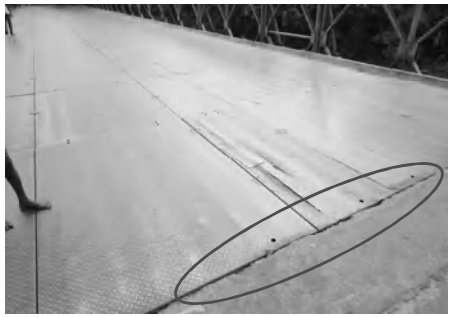
Crack
Delamination
Spalling /Exposed Rebar
Water leakage/Efflorescence
Water Leakage/Puddle
Deformation/Break
Corrosion
Other Defect

Defects Photos

Bridge Number		Bridge Name	Naiori Bridge	Route Name	

Span No.	1	Photo No.	1	Span No.	1	Photo No.	2
Element	Deck Slab	Defect	Corrosion	Element	Deck Slab	Defect	Break
		Rating	C			Rating	C

Span No.	1	Photo No.	3	Span No.	1	Photo No.	4
Element	Bearing	Defect	Accumulation of debris	Element	Expansion Joint	Defect	Difference in Level
		Rating	e			Rating	C



Span No.		Photo No.		Span No.		Photo No.	
Element		Defect		Element		Defect	
		Rating				Rating	

Sample of PSB

Periodic Inspection Report Form

Inspector HARAZAKI, Ikuo Date 23.08.15

File Number		Bridge Name	Naiori Bridge	Superstructure	PSB with Steel Deck	Year	1980
Zone	Rajshahi	Circle	Pabna	Division	Sirajganj	Sub-Division	Sirajganj-1
Survey Result				No. of Hinge	0	Span Length	25.0	Span No.	1

Items of Defects		Steel Material					Concrete Material						Others				Common										Remarks
		Corrosion	Crack	Loose or Missing Bolts	Fracture	Deterioration of Paint System	Crack	Spalling/Exposed Rebar	Water Leakage/Efflorescence	Fallen-out of Deck Slab	Crack of Deck Slab	Delamination	Abnormal Spacing	Difference in Level	Abnomal Bituminous Pavement	Functional disorder of Bearings	Others	Defects of Reinforced Materials	Abnormal Anchorage	Discoloration/deterioration	Water Leakage /Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Deformation/Break	Accumulation of Debris	Settlement/Tilt/Movement	Scour	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
Main Truss	01																										
Main Truss	02																										
Cross Beam	01																										
Cross Beam	02																										
Cross Beam	03																										
Cross Beam	04																										
Cross Beam	05																										
Cross Beam	06																										
Cross Beam	07																										
Cross Beam	08																										
Cross Beam	09																										
Cross Beam	10																										
Cross Beam	11																										
Lateral Bracing	01																										
Lateral Bracing	01																										
Lateral Bracing	02																										
Lateral Bracing	03																										
Lateral Bracing	04																										
Lateral Bracing	05																										
Lateral Bracing	06																										
Lateral Bracing	07																										
Lateral Bracing	08																										
Lateral Bracing	09																										
Lateral Bracing	10																										
Deck Slab (Steel)	01	C																						C			
Abutment / Pier (RC)	01																										
Foundation (RC)	01																										
Retaining Wall	01																										
Bearing	01																								e		
Expansion Joint (Steel)	01													C													
Curb	01																										
Pavement	01																										
Bridge Approaches	01																										
Summary																											
Recommendation																											

Bridge Evaluation Report Form

					Evaluator	KONISHI, Toshiyuki		Date	23.08.15			
File Number		Bridge Name	Naiori Bridge	Superstructure	PSB with Steel Deck		Year	1980				
Zone	Rajshahi	Circle	Pabna	Division	Sirajganj		Sub-Division	Sirajganj-1				
Evaluation Result					Span No.	1	Page No.	1/3				

Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emer-gency	Public Safety	Detailed investi-gation	Remarks
Superstructure	Main Girder, Main Truss, Main Arch, Outer Cable, Main Tower, Arch Rib, Top Slab, * Primary element	Steel	1.Corrosion	✔						
			2.Crack in Steel	✔						
			3.Loose or Missing Bolts	✔						
			4.Fracture	✔						
			5.Deterioration of Paint System	✔						
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	12.Abnormal Spacing	✔						
			16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material	✔						
			18.Abnormal Anchorage							
			19.Discolorlation / Deterioration							
			20.Water Leakage / Puddle	✔						
			21.Abnormal Noise / Vibration	✔						
			22.Abnormal Deflection	✔						
			23.Deformation / Break	✔						
	Cross Beam, Stringer, * Primary element	Steel	1.Corrosion	✔						
			2.Crack in Steel	✔						
			3.Loose or Missing Bolts	✔						
			4.Fracture	✔						
			5.Deterioration of Paint System	✔						
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material	✔						
			18.Abnormal Anchorage							
			19.Discolorlation / Deterioration							
			21.Abnormal Noise / Vibration	✔						
			22.Abnormal Deflection							
			23.Deformation / Break	✔						
	Lateral Bracing, - Secondary element	Steel	1.Corrosion	✔						
			2.Crack in Steel	✔						
			3.Loose or Missing Bolts	✔						
			4.Fracture	✔						
			5.Deterioration of Paint System	✔						
		Others	16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material	✔						
			21.Abnormal Noise / Vibration	✔						
			23.Deformation / Break	✔						
	Deck Slab, * Primary element	Steel	1.Corrosion		✔					
			2.Crack in Steel	✔						
			3.Loose or Missing Bolts	✔						
			4.Fracture	✔						
			5.Deterioration of Paint System	✔						
		Concrete	7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			9.Fallen out of Deck Slab							
			10.Crack of Deck Slab							
			11.Delamination							
		Others	16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material	✔						
			18.Abnormal Anchorage							
			19.Discolorlation / Deterioration							
			20.Water Leakage / Puddle	✔						
			23.Deformation / Break		✔					

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Page No.20 of Appendix

Sample of PSB

Bridge Evaluation Report Form

					Evaluator	KONISHI, Toshiyuki		Date	23.08.15			
File Number		Bridge Name	Naiori Bridge	Superstructure	PSB with Steel Deck		Year	1980				
Zone	Rajshahi	Circle	Pabna	Division	Sirajganj		Sub-Division	Sirajganj-1				
Evaluation Result					Span No.	1	Page No.	2/3				

Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emer-gency	Public Safety	Detailed investi-gation	Remarks
Substructure	Abutment, Pier, Side Wall, Parapet Wall, * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			19.Discolorlation / Deterioration							
			20.Water Leakage / Puddle							
			21.Abnormal Noise / Vibration							
			23.Deformation / Break							
	Foundation, Footing, * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
		Others	16.Other Types of Defects							
		Common	25.Settelment / Tilt / Movement							
			26.Scouring							
	Retaining Wall, - Secondary element	Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			19.Discolorlation / Deterioration							
			23.Deformation / Break							
			25.Settelment / Tilt / Movement							
			26.Scour							
Bearings	Bearing Main Body, Anchor Bolts, * Primary element	Steel (Rubber)	1.Corrosion	✔						
			2.Crack in Steel	✔						
			3.Loose or Missing Bolts	✔						
			4.Fracture	✔						
			5.Deterioration of Paint System	✔						
		Others	12.Abnormal Spacing	✔						
			15.Function Disorder of Bearings	✔						
			16.Other Types of Defects	✔						
		Common	20.Water Leakage / Puddle	✔						
			21.Abnormal Noise / Vibration	✔						
			23.Deformation / Break	✔						
			24.Accumulation of Debris		✔					
			25.Settelment / Tilt / Movement	✔						
	Bearing Seat Mortal, Bearing Bed concrete, * Primary element	Concrete	6.Crack	✔						
			7.Spalling / Exposed Rebar	✔						
			11.Delamination	✔						
		Others	16.Other Types of Defects	✔						
		Common	20.Water Leakage / Puddle	✔						
			23.Deformation / Break	✔						

Bridge Evaluation Report Form

				Evaluator	KONISHI, Toshiyuki		Date	23.08.15			
File Number		Bridge Name	Naiori Bridge	Superstructure	PSB with Steel Deck		Year	1980			
Zone	Rajshahi	Circle	Pabna	Division	Sirajganj		Sub-Division	Sirajganj-1			
Evaluation Result					Span No.	1	Page No.	3/3			

Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Pavement	Others	13.Differnce in Level							
		14.Abnormal Bituminous Pavement							
		16.Other Types of Defects							
- Secondary element	Common	24.Accumulation of Debris							
Bridge Approaches	Others	13.Differnce in Level							
		14.Abnormal Bituminous Pavement							
		16.Other Types of Defects							
- Secondary element	Common	24.Accumulation of Debris							
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							
	Concrete	6.Crack							
		11.Delamination							
	Others	12.Abnormal Spacing	✔						
		13.Differnce in Level		✔					
		16.Other Types of Defects	✔						
	Common	20.Water Leakage / Puddle							
		21.Abnormal Noise / Vibration							
		23.Deformation / Break							
- Secondary element		24.Accumulation of Debris							
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							
	Concrete	6.Crack							
		7.Spalling / Exposed Rebar							
		8.Water leakage /Efflorescence							
		11.Delamination							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
- Secondary element		23.Deformation / Break							
Drainage System > Including - Catch-Basin - Drainage Pipe	Steel Polyvinyl	1.Corrosion							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
		20.Water Leakage / Puddle							
		23.Deformation / Break							
- Secondary element		24.Accumulation of Debris							
Lighting Facility Road Sign Facility	Steel	1.Corrosion							
		2.Crack in Steel							
		3.Loose or Missing Bolts							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
- Secondary element		23.Deformation / Break							
Inspection Facility Utilitiy Pipe	Steel	1.Corrosion							
		2.Crack in Steel							
		3.Loose or Missing Bolts							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	21.Abnormal Noise / Vibration							
- Secondary element		23.Deformation / Break							

Periodic Inspection/Evaluation Report Form (Sample)

File Number	N5-LRP036--00011130			Inspector		Date	
Zone	Dhaka	Circle	Dhaka	Division	Manikganj	Sub-Division	Nayarhat
District	-	Upazilla	-	Union	-	Village	-
Road No.	N5	Road Name	Dhaka(Mirpur)-Utholi-Paturia	LRP Name	LRP036	GPS	Lat 23.91889 / Long 90.12111
Bridge Name	Sreerampur Box Culvert			LRP+Offset (m)	0.679	Chainage (km)	36.679
Year of Construction	1998	Design Standard	-	Design Load	-	Load Ristriction	- (ton)

Feature Intersected		Owner	Public Utilities Carried		Owner
	River	Owner		telephone line	Owner
	Road	Owner		water	Owner
	Railway	Owner			

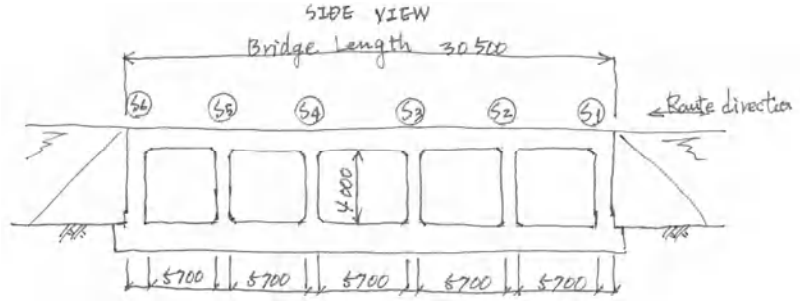
Bridge Length	30.500	No. of Spans	5	Span Arrangement	5.700+5.700+5.700+5.700+5.700	Skew Angle (degree)	90

		Type	Material		Type	Material
Superstructure		Box Culvert	Concrete	Deck Slab	RC	Concrete
Substructure	Abutment		Concrete	Foundation (Abutment)	Piled	Concrete
	Pier	Wall	Concrete	Foundation (Pier)	Piled	Concrete
Other Elements	Pavement	Asphalt		Bearings	None	
	Expansion Joint	None		Railing	Steel	

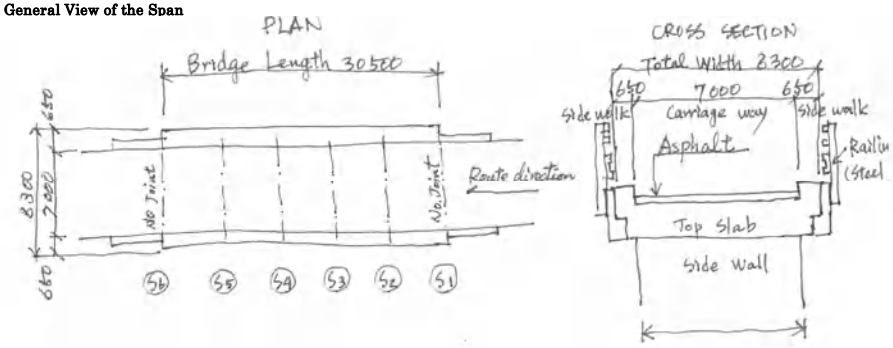
Width	Total Width	8.30 m	Wheel Guard-L	Sidewalk-L	Carriage way-L	Median	Carriage way-R	Sidewalk-R	Wheel Guard-R
	Effective Width	7.00 m	0.0 m	0.65 m	7.00 m	0.0 m	0.65 m	0.0 m	0.0 m

Traffic Conditions	Census (year)		Heavy Vehicle Traffic Rate (%)	0~10 ・10~20 ・20~30 ・30~
	Traffic Volume	Vehicles (Daytime 12 hours)	Condition Category for Entire Bridge	

General View



General View of the Span



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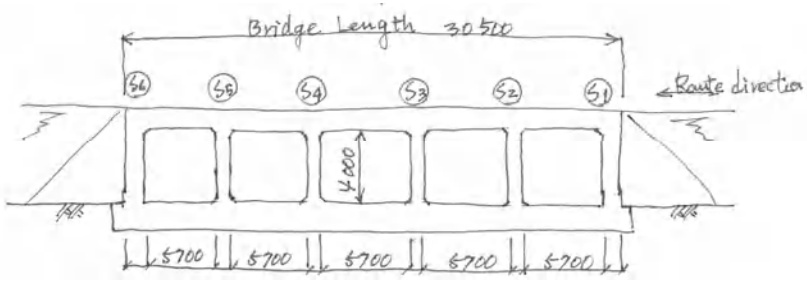
Sample of Box Culvert

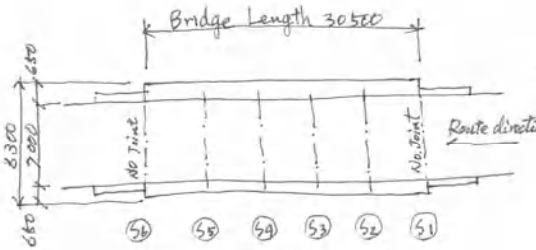
General Drawings

Bridge Number		Bridge Name	Sreerampur BoxCulvert	Route Name	

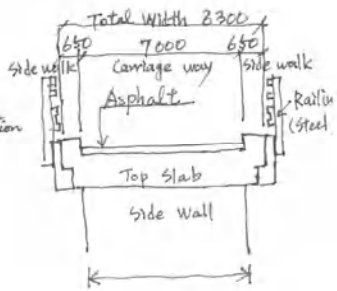
General View



Plan



Cross Section



Overall View Photo

Bridge Number		Bridge Name	Sreerampur BoxCulvert	Route Name	

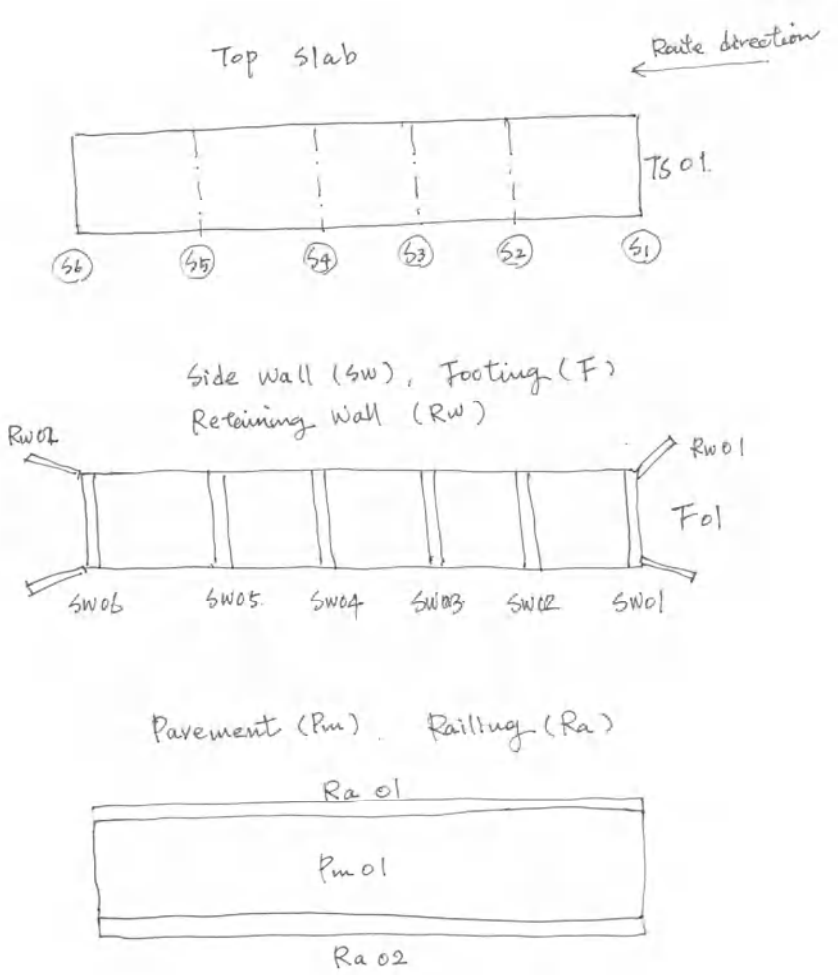
Viewpoint	Side View
Date	19/07/17

Viewpoint	Front View
Date	19/07/17

Viewpoint	Under Bridge
Date	19/07/17

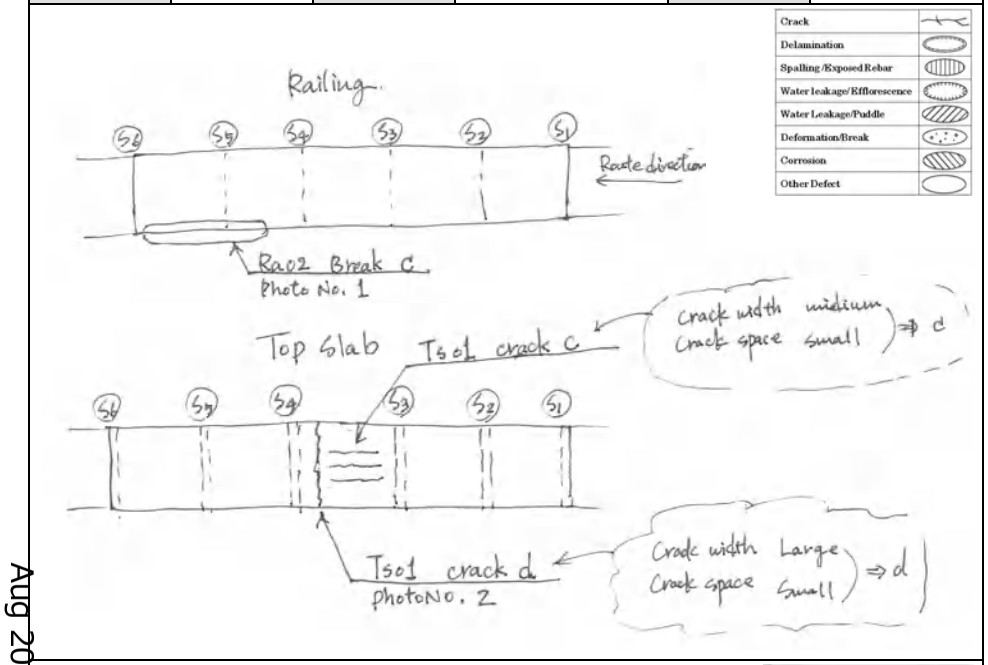
Element Numbering System

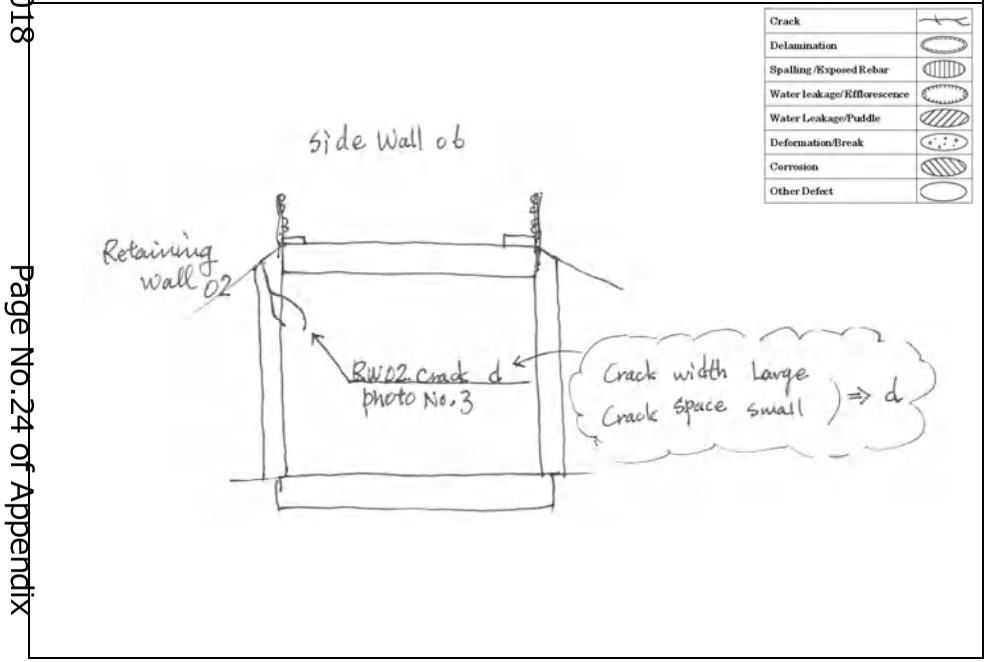
Bridge Number		Bridge Name	Sreerampur BoxCulvert	Route Name		Span No.	



Defect Sketch

Bridge Number		Bridge Name	Sreerampur BoxCulvert	Route Name	





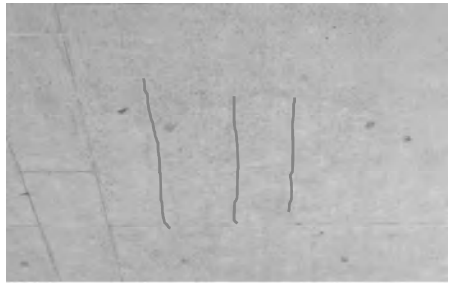
Sample of Box Culvert

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 Slub	Defect	Crack	Element	Top Slub	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	

Periodic Inspection Report Form

Inspector Date 19/07/17

File Number		Bridge Name	Sreerampur BoxCulvert	Superstructure	Box Culvert	Year	1998
Zone	Dhaka	Circle	Dhaka	Division	Manikganj	Sub-Division	Nayarhat
Survey Result		No. of Hinge	0	Span Length	5.70	Span No.	

Items of Defects		Steel Material					Concrete Material						Others					Common									
		Corrosion	Crack	Loose or Missing Bolts	Fracture	Deterioration of Paint System	Crack	Spalling/Exposed Rebar	Water Leakage/Efflorescence	Fallen-out of Deck Slab	Crack of Deck Slab	Delamination	Abnormal Spacing	Difference in Level	Abnomal Bituminous Pavement	Functional disorder of Bearings	Others	Defects of Reinforced Materials	Abnormal Anchorage	Discoloration/deterioration	Water Leakage /Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Deformation/Break	Accumulation of Debris	Settlement/Tilt/Movement	Scour
		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
Top Slab	01						d																				
Side Wall	01																										
Side Wall	02																										
Footing	01																										
Retaining Wall	01																										
Retaining Wall	02						d																				
Railing (Steel)	01																										
Railing (Steel)	02																							c			
Pavement	01																										
Summary																											
Recommendation																											

Aug 2018

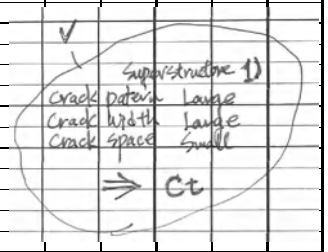
Page No.25 of Appendix

Bridge Evaluation Report Form

Evaluator Date 19/07/17

File Number		Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert	Year	1938
Zone		Circle		Division		Sub-Division	
Evaluation Result					Span No.		Page No. 1/3

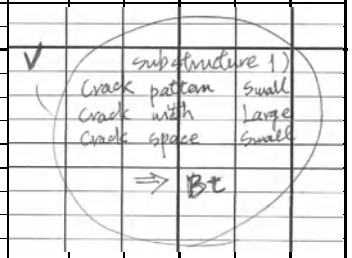
Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emer-gency	Public Safety	Detailed investi-gation	Remarks
Superstructure	Main Girder, Main Truss, Main Arch, Outer Cable, Main Tower, Arch Rib, Top Slab	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	12.Abnormal Spacing							
			16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			18.Abnornal Anchorage							
			19.Discolorlation / Deterioration							
			20.Water Leakage / Puddle							
			21.Abnormal Noise / Vibration							
			22.Abnormal Deflection							
	* Primary element		23.Deformation / Break							
	Cross Beam, Stringer	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			18.Abnornal Anchorage							
			19.Discolorlation / Deterioration							
			21.Abnormal Noise / Vibration							
			22.Abnormal Deflection							
	* Primary element		23.Deformation / Break							
	Lateral Bracing	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			21.Abnormal Noise / Vibration							
	- Secondary element		23.Deformation / Break							
	Deck Slab	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			9.Fallen out of Deck Slab							
			10.Crack of Deck Slab							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			18.Abnornal Anchorage							
			19.Discolorlation / Deterioration							
			20.Water Leakage / Puddle							
	* Primary element		23.Deformation / Break							



Bridge Evaluation Report Form

File Number		Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert	Evaluator	Date	19/07/17
Zone		Circle		Division		Sub-Division	Year	1938
Evaluation Result				Span No.		Page No.		2/3

Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Substructure	Abutment Pier Side Wall Parapet Wall	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			19.Discolorlation / Deterioration							
			20.Water Leakage / Puddle							
			21.Abnormal Noise / Vibration							
	* Primary element		23.Deformation / Break							
	Foundation Footing	Steel	1.Corrosion							
			2.Crack in Steel							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
		Others	16.Other Types of Defects							
		Common	25.Settelment / Tilt / Movement							
	* Primary element		26.Scouring							
	Retaining Wall	Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			19.Discolorlation / Deterioration							
			23.Deformation / Break							
			25.Settelment / Tilt / Movement							
	- Secondary element		26.Scour							
Bearings	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							
		Others	12.Abnormal Spacing							
			15.Function Disorder of Bearings							
			16.Other Types of Defects							
		Common	20.Water Leakage / Puddle							
			21.Abnormal Noise / Vibration							
			23.Deformation / Break							
			24.Accumulation of Debris							
			25.Settelment / Tilt / Movement							
	* Primary element									
	Bearing Seat Mortal Bearing Bed concrete	Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	20.Water Leakage / Puddle							
	* Primary element		23.Deformation / Break							

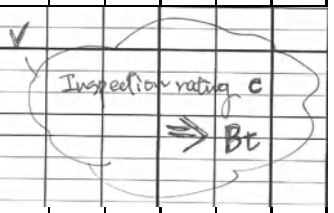


Sample of Box Culvert

Bridge Evaluation Report Form

File Number		Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert	Evaluator	Date	19/07/17
Zone		Circle		Division		Sub-Division	Year	1938
Evaluation Result					Span No.		Page No.	3/3

Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Pavement	Others	13.Differnce in Level							
		14.Abnormal Bituminous Pavement							
		16.Other Types of Defects							
- Secondary element	Common	24.Accumulation of Debris							
Bridge Approaches	Others	13.Differnce in Level							
		14.Abnormal Bituminous Pavement							
		16.Other Types of Defects							
- Secondary element	Common	24.Accumulation of Debris							
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							
	Concrete	6.Crack							
		11.Delamination							
	Others	12.Abnormal Spacing							
		13.Differnce in Level							
		16.Other Types of Defects							
	Common	20.Water Leakage / Puddle							
		21.Abnormal Noise / Vibration							
		23.Deformation / Break							
- Secondary element		24.Accumulation of Debris							
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							
	Concrete	6.Crack							
		7.Spalling / Exposed Rebar							
		8.Water leakage /Efflorescence							
		11.Delamination							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
- Secondary element		23.Deformation / Break							
Drainage System > Including - Catch-Basin - Drainage Pipe	Steel Polyvinyl	1.Corrosion							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
		20.Water Leakage / Puddle							
		23.Deformation / Break							
- Secondary element		24.Accumulation of Debris							
Lighting Facility Road Sign Facility	Steel	1.Corrosion							
		2.Crack in Steel							
		3.Loose or Missing Bolts							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
- Secondary element		23.Deformation / Break							
Inspection Facility Utilitiy Pipe	Steel	1.Corrosion							
		2.Crack in Steel							
		3.Loose or Missing Bolts							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	21.Abnormal Noise / Vibration							
- Secondary element		23.Deformation / Break							



Periodic Inspection/Evaluation Report Form (Sample)

File Number	N1, 8b			Inspector		Date	
Zone	Dhaka	Circle	Dhaka	Division	Narayangnj-1	Sub-Division	Narayangnj-1
District		Upazilla		Union		Village	
Road No.	N1	Road Name	Dhaka(Jatrabari)-Comilla-Chittagong-Taknaf	LRP Name	8b	GPS Lat	23d-42'-7.5"
						GPS Long	90d-30'-57.3"
Bridge Name	Nagamachi Bridge	LRP+Offset (m)	5+3976			Chainage (km)	8.976
Year of Construction	1938	Design Standard		Design Load	TL-20	Load Ristriction	6 (ton)

Feature Intersected		Owner	Public Utilities Carried		Owner
	River	Owner		telephone line	Owner
	Road	Owner		water	Owner
	Railway	Owner			

Bridge Length	4.420	No. of Spans	1	Span Arrangement	4.420	Skew Angle (degree)	63

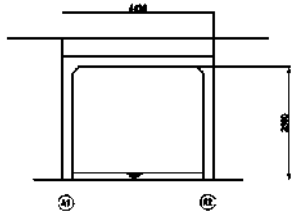
		Type	Material		Type	Material
Superstructure		Box Culvert	Concrete	Deck Slab	RC	Concrete
Substructure	Abutment	---		Foundation (Abutment)	---	Steel
	Pier	---		Foundation (Pier)	---	
Other Elements	Pavement	Asphalt		Bearings	None	
	Expansion Joint	None		Railing	Steel	

Width	Total Width	6.05 m	Wheel Guard-L	Sidewalk-L	Carriage way-L	Median	Carriage way-R	Sidewalk-R	Wheel Guard-R
	Effective Width	6.05 m	0.2 m	0.0 m	5.65 m	0.0 m	0.0 m	0.2 m	0.0 m

Traffic Conditions	Census (year)		Heavy Vehicle Traffic Rate (%)	0～10・10～20・20～30・30～
	Traffic Volume	Vehicles (Daytime 12 hours)	Condition Category for Entire Bridge	35 B

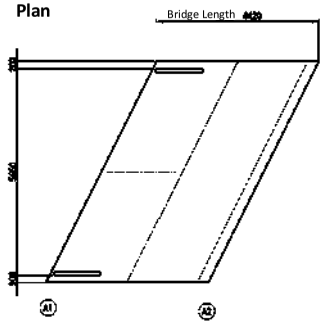
General View

Side View



General View of the Span

Plan



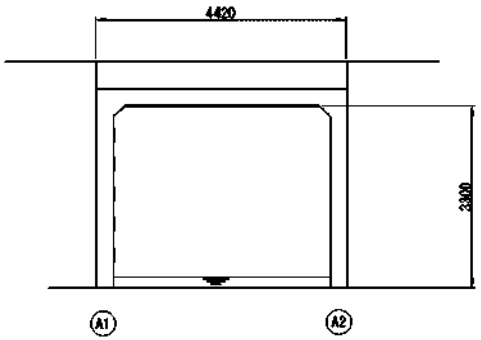
Cross Section

Sample of Box Culvert 2

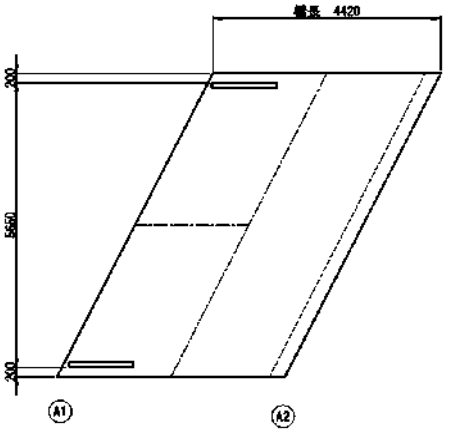
General Drawings

Bridge Number		Bridge Name	Nagamachi Bridge	Route Name	

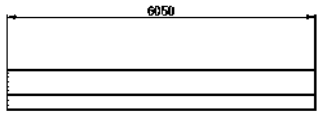
General View



Plan



Cross Section



Sample of Box Culvert 2

Overall View Photo

Bridge Number		Bridge Name	Nagamachi Bridge	Route Name	

Viewpoint	Side View
Date	

Viewpoint	Front View
Date	

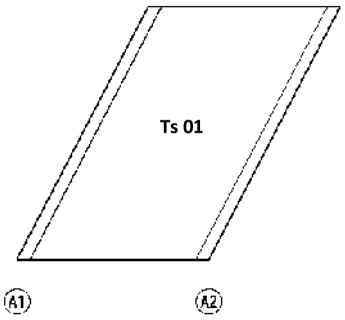
Viewpoint	Under Bridge
Date	

Element Numbering System

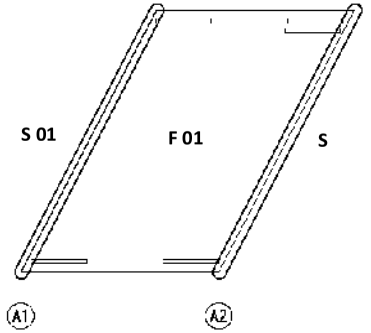
Bridge Number		Bridge Name	Nagamachi Bridge	Route Name	

Span No.	1

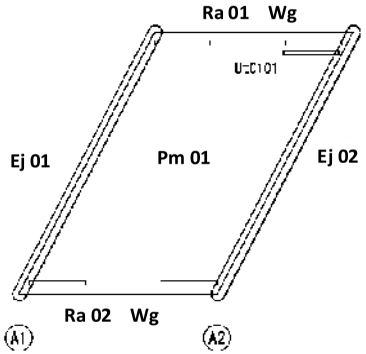
Top Slab (Ts)



Side Wall (S), Footing (F)



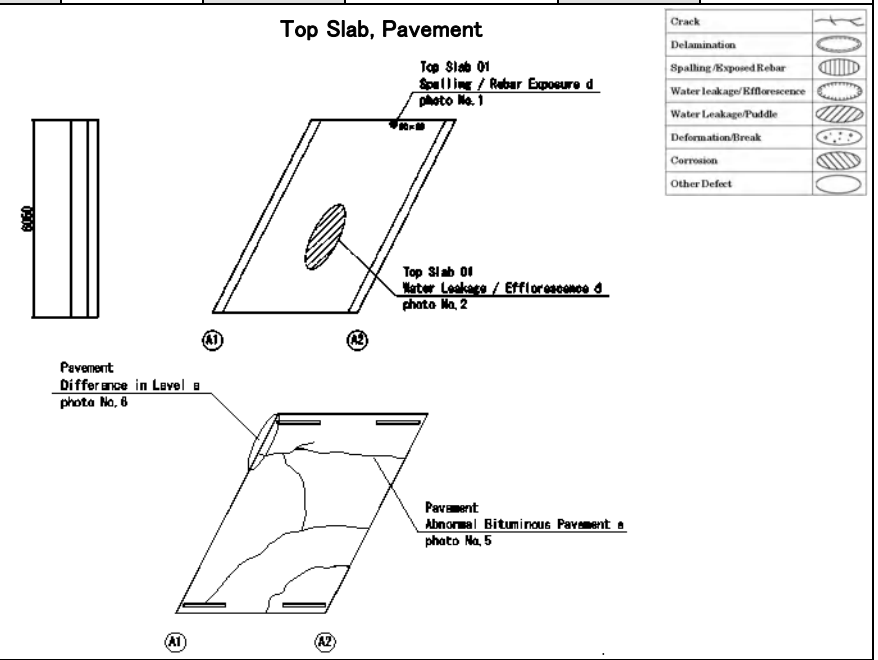
Railing (Ra), Wheel Gurad(Wg)
Expansion Joint (Ej), Pavement (Pm)



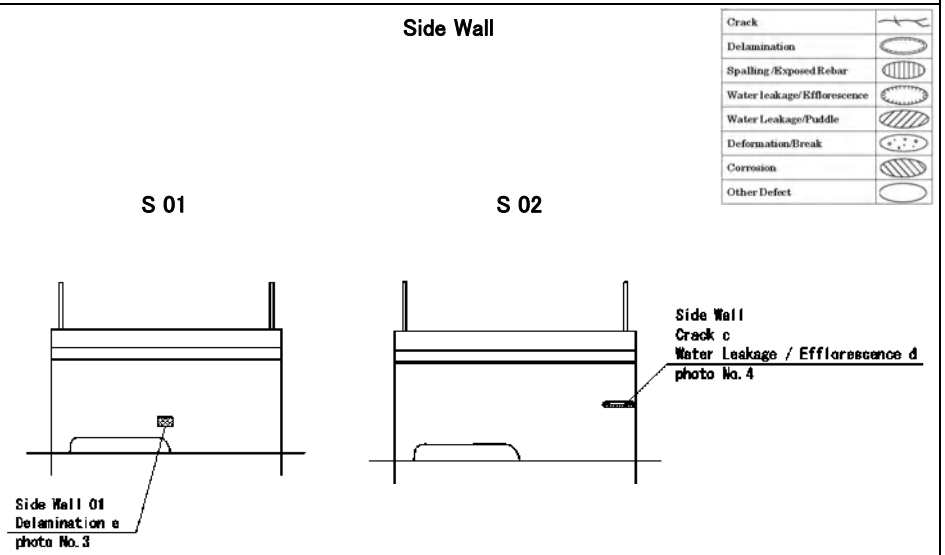
Defect Sketch

Bridge Number		Bridge Name	Nagamachi Bridge	Route Name	

Top Slab, Pavement



Side Wall



Sample of Box Culvert 2

Defect Photos

Bridge Number		Bridge Name	Nagamachi Brid	Route Name	

Span No.	1	Photo No.	1	Span No.	1	Photo No.	2
Element	Top Slab	Defect	Spalling/Rebar Exposure	Element	Top Slab	Defect	Water Leakage / Puddle
		Rating	d			Rating	e

Span No.	1	Photo No.	3	Span No.	1	Photo No.	4
Element	Side Wall	Defect	Delamination	Element	Side Wall	Defect	Leakage/Efflorescence
		Rating	e			Rating	d

Span No.	1	Photo No.	5	Span No.	1	Photo No.	6
Element	Pavement	Defect	Abnomal Bituminous	Element	Pavement	Defect	Diffrence in Level
		Rating	e			Rating	e

Periodic Inspection Report Form

Inspector Date

File Number		Bridge Name	Ngamachi Bridge	Superstructure	Box Culvert	Year	1938
Zone		Circle		Division		Sub-Division	
Survey Result		No. of Hinge	0	Span Length	4.42m	Span No.	1

Items of Defects		Steel Material					Concrete Material						Others				Common									Remarks
		Corrosion	Crack	Loose or Missing Bolts	Fracture	Deterioration of Paint System	Crack	Spalling/Exposed Rebar	Water Leakage/Eflorescence	Fallen-out of Deck Slab	Crack of Deck Slab	Delamination	Abnormal Spacing	Difference in Level	Abnomal Bituminous Pavement	Functional disorder of Bearings	Others	Defects of Reinforced Materials	Abnormal Anchorage	Discoloration/deterioration	Water Leakage /Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Deformation/Break	Accumulation of Debris	Settlement/Tilt/Movement	Scour	
		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	
Top Slab	01							d	e																			
Side Wall	01						c		d			e															
Footing	01																											
Retaining Wall	01																											
Railing (Steel)	01																											
Wheel Gurad	01																											
Drainage System	01																											
Pavement	01													e	e													
Bridge Approaches	01																											
Lighting Facility	01																											
Road Sign	01																											
Utility Pipe	01																											
Summary																												
Recommendation																												

Aug 2018

Bridge Evaluation Report Form

Evaluator Date

File Number		Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert	Year	1938
Zone		Circle		Division		Sub-Division	
Evaluation Result					Span No.	1	Page No. 1/3

Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emer-gency	Public Safety	Detailed investi-gation	Remarks
Superstructure	Main Girder / Main Truss / Main Arch / Outer Cable / Main Tower / Arch Rib / Top Slab / * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack	✔						
			7.Spalling / Exposed Rebar		✔					
			8.Water leakage /Efflorescence		✔					
			11.Delamination	✔						
		Others	12.Abnormal Spacing	✔						
			16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material							
			18.Abnormal Anchorage							
			19.Discolorlation / Deterioration	✔						
			20.Water Leakage / Puddle	✔						
			21.Abnormal Noise / Vibration	✔						
			22.Abnormal Deflection							
			23.Deformation / Break	✔						
	Cross Beam / Stringer / * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			18.Abnormal Anchorage							
			19.Discolorlation / Deterioration							
			21.Abnormal Noise / Vibration							
			22.Abnormal Deflection							
			23.Deformation / Break							
	Lateral Bracing / - Secondary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			21.Abnormal Noise / Vibration							
			23.Deformation / Break							
	Deck Slab / * Primary element	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			9.Fallen out of Deck Slab							
			10.Crack of Deck Slab							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			18.Abnormal Anchorage							
			19.Discolorlation / Deterioration							
			20.Water Leakage / Puddle							
			23.Deformation / Break							

Bridge Evaluation Report Form

Evaluator				Date						
File Number		Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert			Year	1938	
Zone		Circle		Division				Sub-Division		
Evaluation Result					Span No.		1	Page No.		2/3

Component	Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Substructure	Abutment Pier Side Wall Parapet Wall	Steel	1.Corrosion							
			2.Crack in Steel							
			3.Loose or Missing Bolts							
			4.Fracture							
			5.Deterioration of Paint System							
		Concrete	6.Crack		✔					
			7.Spalling / Exposed Rebar	✔						
			8.Water leakage /Efflorescence		✔					
			11.Delamination		✔					
		Others	16.Other Types of Defects	✔						
		Common	17.Defects of Reinforcing material	✔						
			19.Discolorlation / Deterioration	✔						
			20.Water Leakage / Puddle	✔						
			21.Abnormal Noise / Vibration	✔						
	* Primary element		23.Deformation / Break	✔						
	Foundation Footing	Steel	1.Corrosion							
			2.Crack in Steel							
			5.Deterioration of Paint System							
		Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
		Others	16.Other Types of Defects							
		Common	25.Settelment / Tilt / Movement							
	* Primary element		26.Scouring							
	Retaining Wall	Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			8.Water leakage /Efflorescence							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	17.Defects of Reinforcing material							
			19.Discolorlation / Deterioration							
			23.Deformation / Break							
			25.Settelment / Tilt / Movement							
	- Secondary element		26.Scour							
Bearings	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							
		Others	12.Abnormal Spacing							
			15.Function Disorder of Bearings							
			16.Other Types of Defects							
		Common	20.Water Leakage / Puddle							
			21.Abnormal Noise / Vibration							
			23.Deformation / Break							
			24.Accumulation of Debris							
	* Primary element		25.Settelment / Tilt / Movement							
	Bearing Seat Mortal Bearing Bed concrete	Concrete	6.Crack							
			7.Spalling / Exposed Rebar							
			11.Delamination							
		Others	16.Other Types of Defects							
		Common	20.Water Leakage / Puddle							
	* Primary element		23.Deformation / Break							

Aug 2018

Page No.31 of Appendix

Sample of Box Culvert 2

Bridge Evaluation Report Form

Evaluator				Date						
File Number		Bridge Name	Nagamachi Bridge	Superstructure	Box Culvert			Year	1938	
Zone		Circle		Division				Sub-Division		
Evaluation Result					Span No.		1	Page No.		3/3

Element Type	Material	Type of Defects	At No Repair	Bt Minor Repair	Ct Major Repair	Dt Emergency	Public Safety	Detailed investigation	Remarks
Pavement	Others	13.Differnce in Level	✔		✔				
		14.Abnormal Bituminous Pavement		✔					
		16.Other Types of Defects	✔						
- Secondary element	Common	24.Accumulation of Debris	✔						
Bridge Approaches	Others	13.Differnce in Level							
		14.Abnormal Bituminous Pavement							
		16.Other Types of Defects							
- Secondary element	Common	24.Accumulation of Debris							
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							
	Concrete	6.Crack							
		11.Delamination							
	Others	12.Abnormal Spacing							
		13.Differnce in Level							
		16.Other Types of Defects							
	Common	20.Water Leakage / Puddle							
		21.Abnormal Noise / Vibration							
		23.Deformation / Break							
- Secondary element		24.Accumulation of Debris							
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							
	Concrete	6.Crack							
		7.Spalling / Exposed Rebar							
		8.Water leakage /Efflorescence							
		11.Delamination							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
- Secondary element		23.Deformation / Break							
Drainage System > Including - Catch-Basin - Drainage Pipe	Steel Polyvinyl	1.Corrosion							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
		20.Water Leakage / Puddle							
		23.Deformation / Break							
- Secondary element		24.Accumulation of Debris							
Lighting Facility Road Sign Facility	Steel	1.Corrosion							
		2.Crack in Steel							
		3.Loose or Missing Bolts							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	19.Discolorlation / Deterioration							
- Secondary element		23.Deformation / Break							
Inspection Facility Utilitiy Pipe	Steel	1.Corrosion							
		2.Crack in Steel							
		3.Loose or Missing Bolts							
		4.Fracture							
		5.Deterioration of Paint System							
	Others	16.Other Types of Defects							
	Common	21.Abnormal Noise / Vibration							
- Secondary element		23.Deformation / Break							

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	
	13)	Difference in Level	a	-	c	-	e	T≧20mm or not
	14)	Abnormal Bituminous Pavement	a	-	c	-	e	
	15)	Functional Disorder of Bearings	a	-	-	-	e	
	16)	Other Types of Defects	a	-	-	-	e	Illegal Occupation, Scrawl, Missing of Sealing material, Fire Damage etc.
Common Defects								
Common	17)	Defects of Reinforcing Materials for Rehabilitation/Strengthening	a		c		e	Steel Plate, Fiber, Concrete Member, Painting
	18)	Abnormal Anchorage	a	-	c	-	e	Anchorage of PC Tendon
	19)	Discoloration/Deterioration of Materials	a	-	-	-	e	Concrete, Rubber, Plastics
	20)	Water Leakage/Puddle	a	-	-	-	e	
	21)	Abnormal Noise/Vibration	a	-	-	-	e	
	22)	Abnormal Deflection	a	-	-	-	e	
	23)	Deformation/Break	a	-	c	-	e	
	24)	Accumulation of Debris	a	-	-	-	e	
	25)	Settlement/Tilt/Movement	a	-	-	-	e	
	26)	Scouring	a	-	c	-	e	

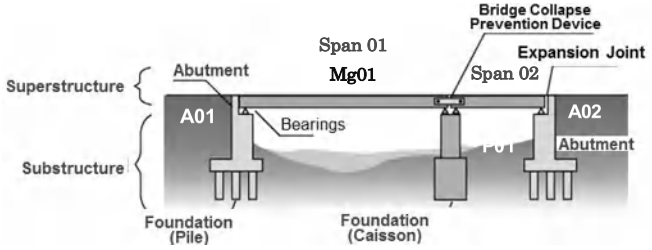
Bridge Element Numbering System

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

1) Superstructure

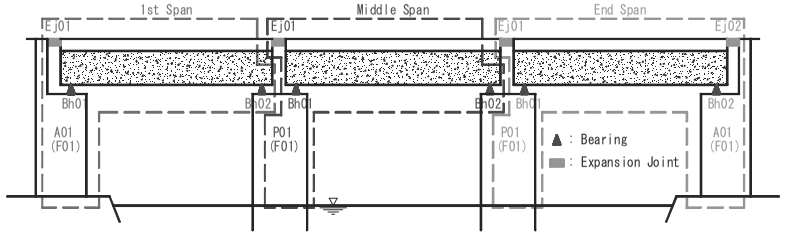
The superstructure element numbering system should include the spans, the girders, and in case of truss the panel point

The spans should be numbered consecutively, with Span 1 located at the beginning of the bridge. Multiple girders should be numbered consecutively from left to right facing in the route directions.

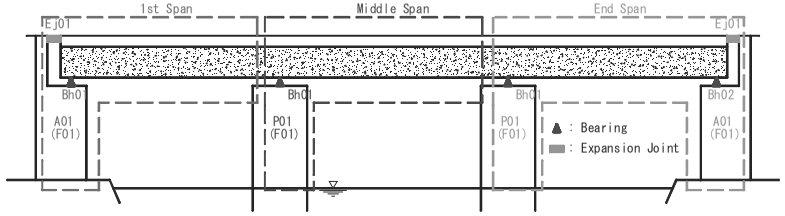


Each element of main girders and deck slab, abutment and piers, and bearings is numbered according to the following span configuration..

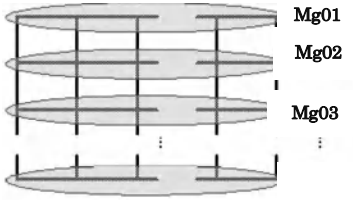
a. Simple span



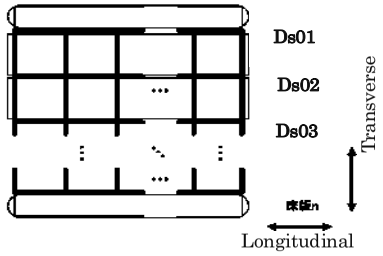
b. Continuous Span



Main Girders



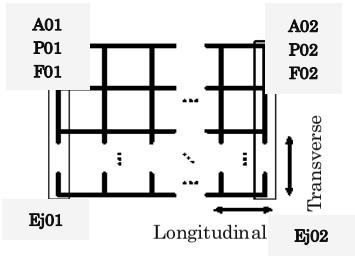
Deck Slab



2) Substructure and Expansion joint

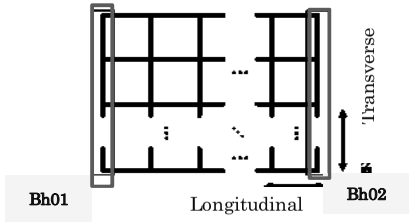
Substructure element numbering system should include the abutments and piers. A01 is located at the beginning of the bridge, and A02 is located at the end.

The piers should be numbered consecutively, with P01 located closest to the beginning of the bridge.



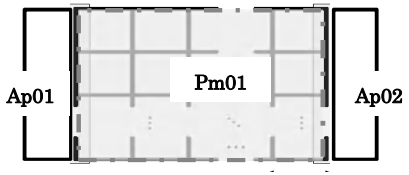
3) Bearings (Bh)

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



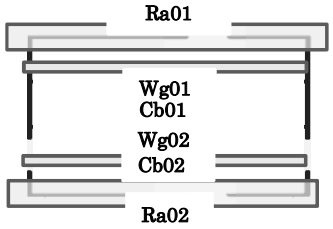
4) Pavement (Pm), Approaches (Ap)

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

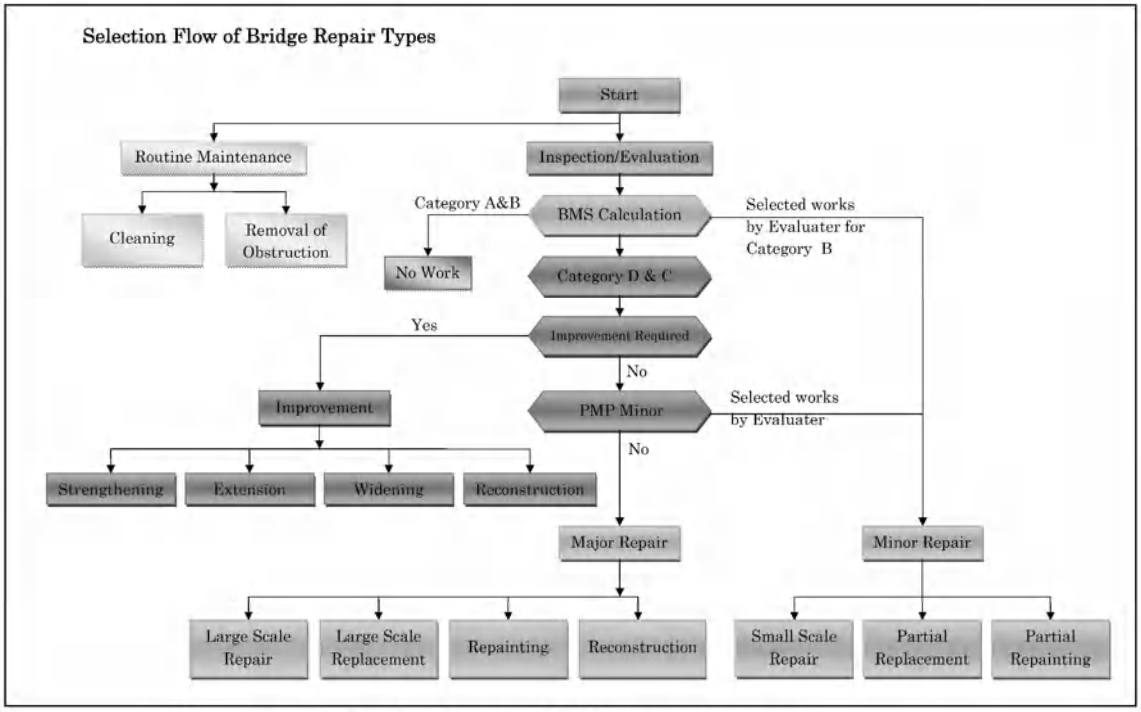


Figure 1-4 Selection Flow of Bridge repair types

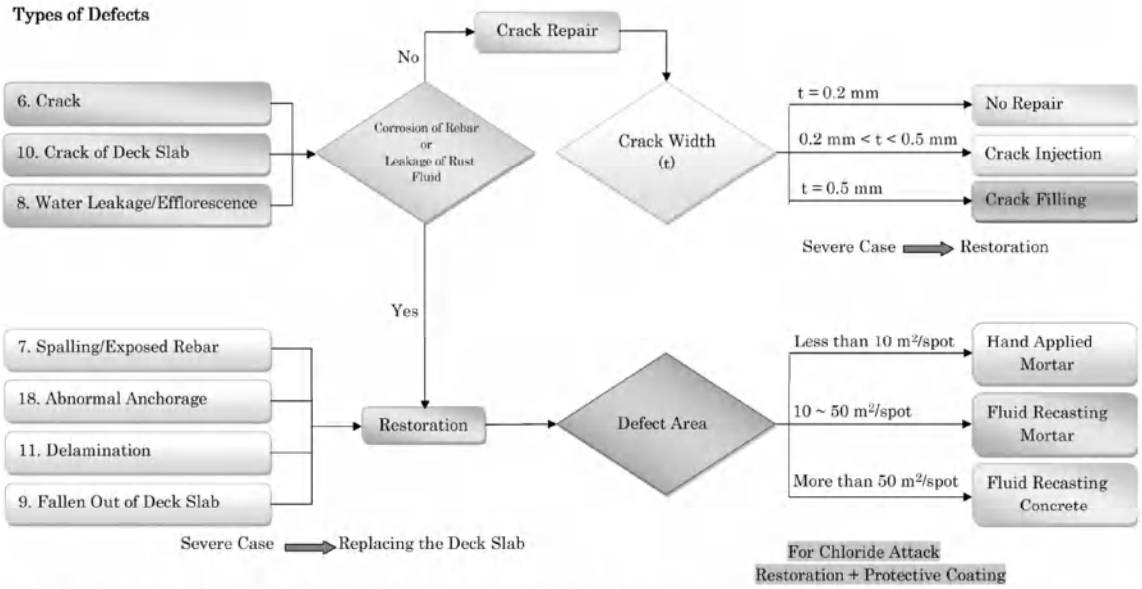


Figure 4-1 Selection Flow of Repair method of Concrete elements (Superstructure)

The Flow based by Local Government Jp

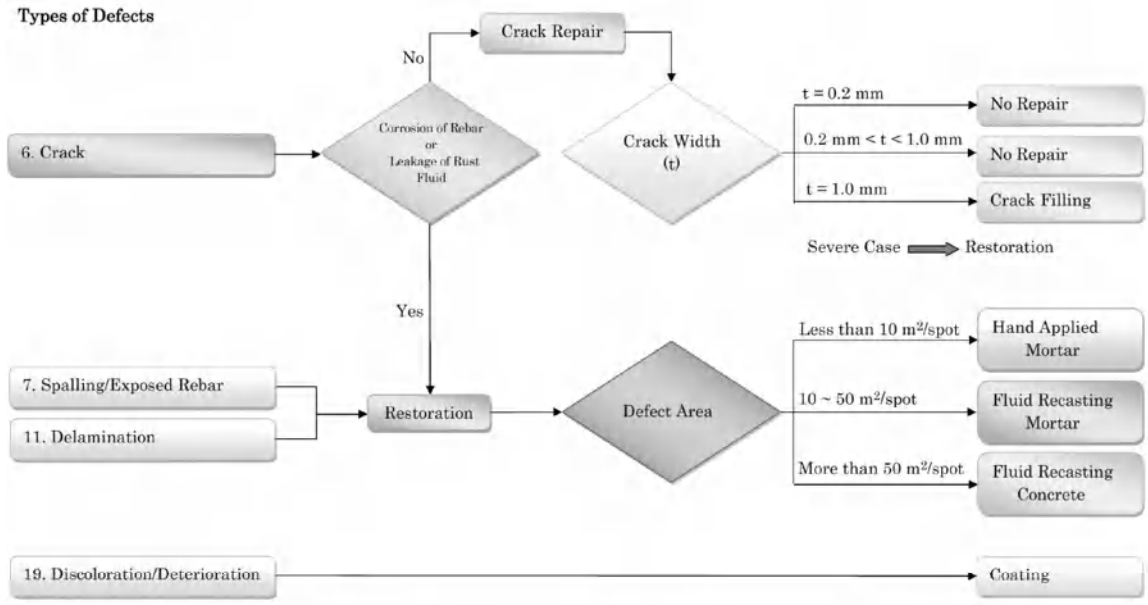


Figure 4-2 Selection Flow of Repair method of Concrete elements (Substructure)

The Flow based by Local Government Jp

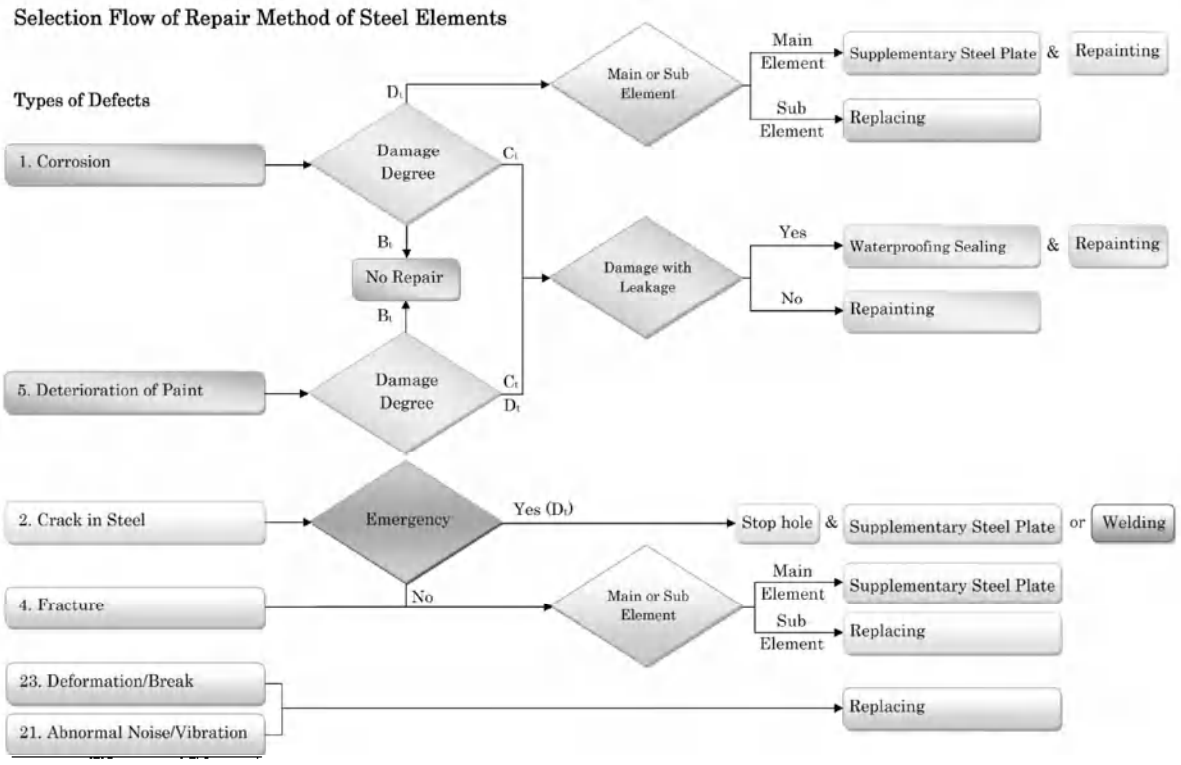


Figure 4-3 Selection Flow of Repair method of steel elements

The Flow based by Local Government Jp

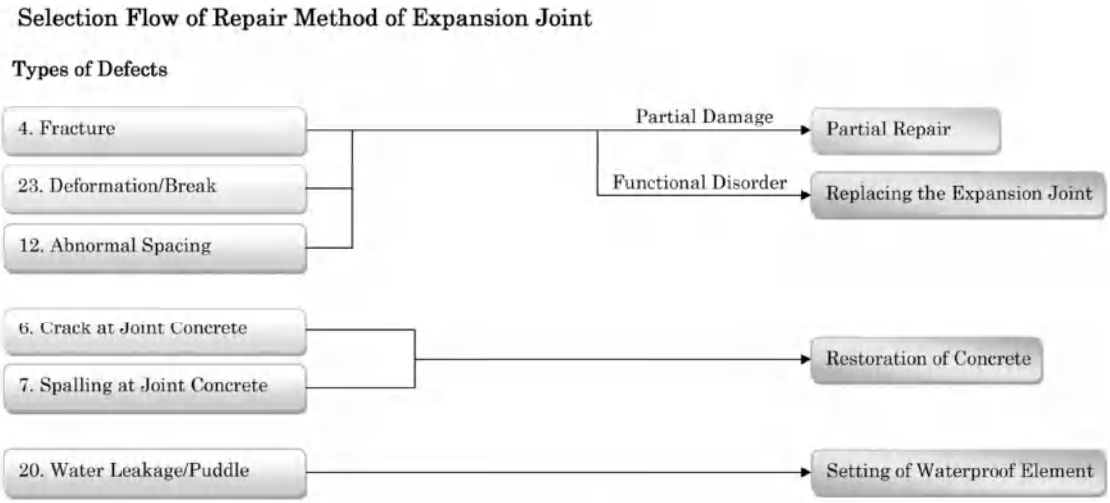


Figure 4-9 Selection Flow of Repair method of Expansion joint

The Flow based by Local Government Jp

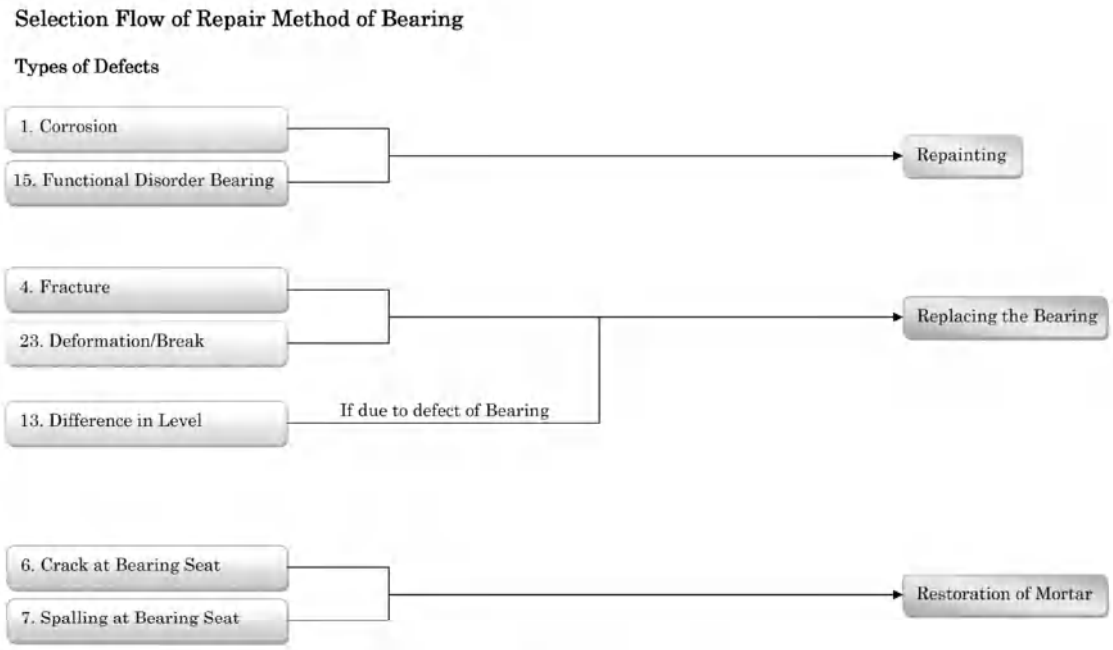


Figure 4-11 Selection Flow of Repair method of Bearing

The Flow based by Local Government Jp

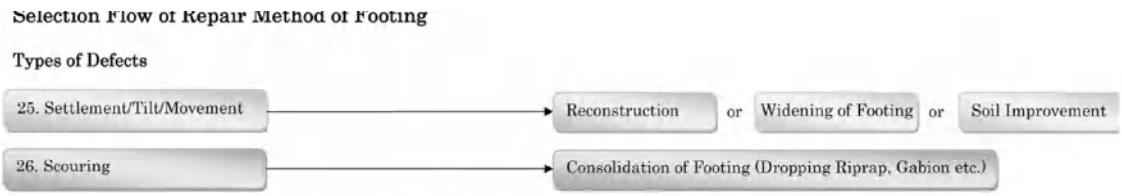


Figure 4-13 Selection Flow of Repair method of Footing

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

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	RS04-009a-20171129					Date	Nov 29, 2017		
Zone	Dhaka	Circle	Dhaka	Division	Manikganj	Sub-Division	Manikganj	SO	-
District	Manikganj	Upazila	-	Union	-		Village		-
Road No.	RS04	Road Name	Hamayetpur-Singair-Manikganj		LRP Name	009a	GPS	Lat	23º 48' 20"
								Long	90º 11' 22"
Bridge Name	**Aynal bridge**		LRP+Offset	182 (m)			Chainage		9.182 (m)
Year of Construction	2008	Design Standard	AASHTO			Design Load	20 Ton	Load Restriction	-
Public Utilities Carried	-		-						
Bridge Length	25.40 (m)	No. of Spans	1	Span Arrangement	25.4		Skew Angle		-
		Type	Material			Type		Material	
Superstructure	Bridge Type	RC Girder Bridge	Concrete		Deck Slab	-		-	
Substructure	Abutment	RC	-		Foundation (Abutment)	Piled foundations		-	
	Pier	-	-		Foundation (Pier)	Piled foundations		-	
Other Elements	Pavement	Asphalt	-		Bearings	-		-	
	Expansion Joint	-	-		Railing	-		-	
Width	Total Width	9.52 (m)	Curb-L	Sidewalk-L	Carriage wey-L	Median	Carriage way-R	Sidewalk-R	Curb-R
	Effective Width	7.30 (m)	-	1.11 (m)	-	-	-	1.11 (m)	-
Traffic Conditions		Census (Year)	-			Condition Category for Entire Bridge		-	A
		Traffic Volume	1,000 to 5,000 Vehicles						

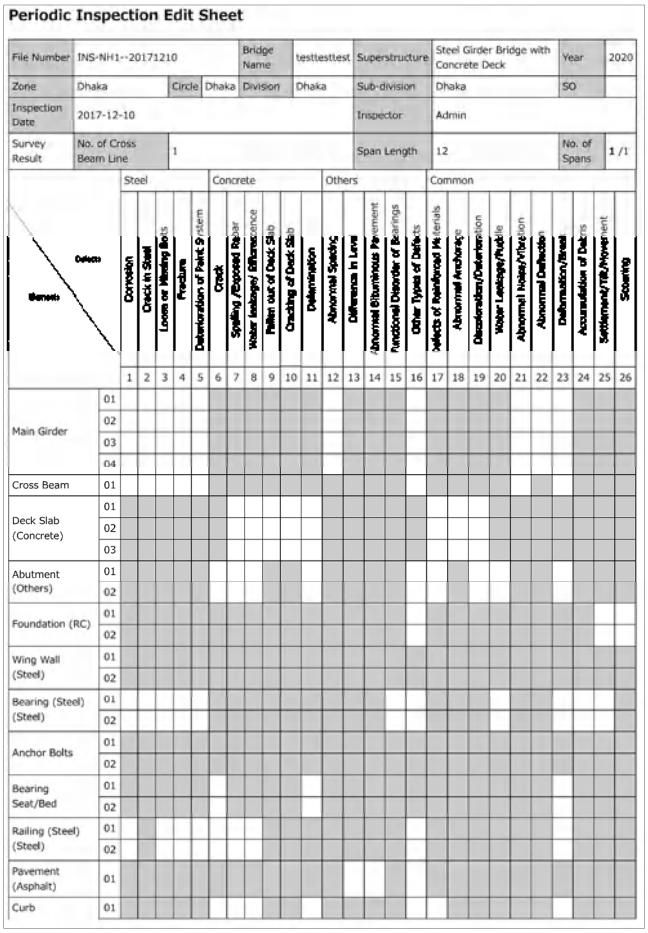
General View

Aynal Bridge

Aynal Bridge

Aynal Bridge

fig. Bridge Inventory

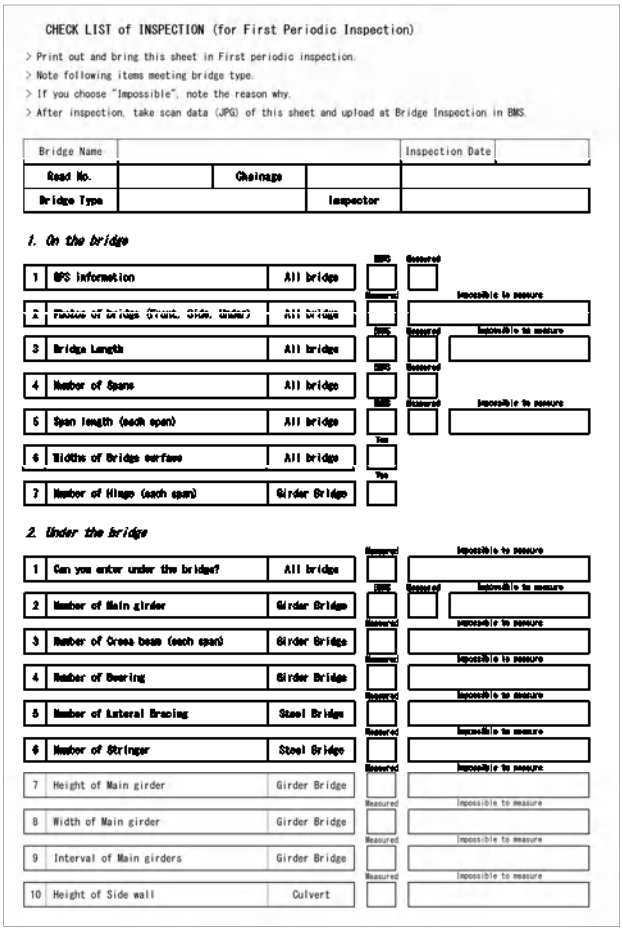


Periodic Inspection Edit Sheet

File Number	INS-NH1--20171210			Bridge Name	testtesttest	Superstructure	Steel Girder Bridge with Concrete Deck	Year	2020
Zone	Dhaka	Circle	Dhaka	Division	Dhaka	Sub-division	Dhaka	SO	
Inspection Date	2017-12-10					Inspector	Admin		
Survey Result	No. of Cross Beam Line	1				Span Length	12	No. of Spans	1 /1

Members \ 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	Pallet out of Deck Slab	Cracking of Deck Slab	Delamination	Abnormal Sounds	Difference in Level	Abnormal Bituminous Pavement	Functional Disorder of Bearings	Other Types of Defects	Defects of Reinforced Materials	Abnormal Anchorage	Discoloration/Deterioration	Water Leakage/Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Delamination/Bleed	Accumulation of Debris	Settlement/Tilt/Movement	Scouring
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Main Girder	01																										
	02																										
	03																										
	04																										
Cross Beam	01																										
Deck Slab (Concrete)	01																										
	02																										
	03																										
Abutment (Others)	01																										
	02																										
Foundation (RC)	01																										
	02																										
Wing Wall (Steel)	01																										
	02																										
Bearing (Steel) (Steel)	01																										
	02																										
Anchor Bolts	01																										
	02																										
Bearing Seat/Bed	01																										
	02																										
Railing (Steel) (Steel)	01																										
	02																										
Pavement (Asphalt)	01																										
Curb	01																										

fig. Blank Inspection Sheet



CHECK LIST of INSPECTION (for First Periodic Inspection)

> Print out and bring this sheet in First periodic inspection.
> Note following items meeting bridge type.
> If you choose "Impossible", note the reason why.
> After inspection, take scan data (JPG) of this sheet and upload at Bridge Inspection in BMS.

Bridge Name			Inspection Date	
Road No.		Chainage		
Bridge Type		Inspector		

1. On the bridge

			BMS	Measured	
1	BMS Information	All bridge			
2	Number of Bridge (Truss, Girder, Under)	All bridge			Impossible to measure
3	Bridge Length	All bridge	BMS	Measured	Impossible to measure
4	Number of Spans	All bridge	BMS	Measured	
5	Span length (each span)	All bridge	BMS	Measured	Impossible to measure
6	Width of Bridge surface	All bridge	Yes		
7	Number of Hinge (each span)	Girder Bridge	Yes		

2. Under the bridge

			Measured	
1	Can you enter under the bridge?	All bridge		Impossible to measure
2	Number of Main girder	Girder Bridge	BMS	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.

1. Information Gathering (in your office)

> You can refer BMMS (and drawings and documents).

> It is difficult to get length information with BMMS.

> It's better to carry out *Pre-survey* to get information and general photos.

↓

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

> Creating new bridge data in BMS and inputting Bridge basic data.

> If you don't have some information to input basic data, you can refer this manual.
You can input them as temporary data or ignore to input into BMS.

↓

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

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

↓

4. Bridge Site Inspection

> Take general photos.

> Get information of bridge shape and number of each element.

> Measure bridge length and width.

> Carry out bridge inspection and note field sketch and rating of defects.

↓

5. After Bridge Site Inspection (in your office)

> Modify or fill basic data inputted as temporary in BMS.

> Input the length information into BMS, if you can measure or estimate them.

→ If you can't get length information, input "Temporary length" referring this manual.

> Upload general photos to BMS.

> Take scan data of field sketch and CHECK LIST and upload them to BMS.

> Edit photo book excel sheet and upload it to BMS as PDF.

fig. Flowchart of Bridge Site Inspection

Chapter 3. Two types of Temporary input

In this manual, two types of temporary input method exist like as following.
It is necessary to pay attention to judge which type of temporary input you use.

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

  Because before 1st Periodic Inspection, it is necessary to create blank inspection sheet, you may input temporary data to fill Basic Data form.
  This type of temporary input allows to set only before bridge site inspection.
  After bridge inspection, "all" temporary inputted data should be modified or filled with true data based on result of the bridge inspection.

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

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

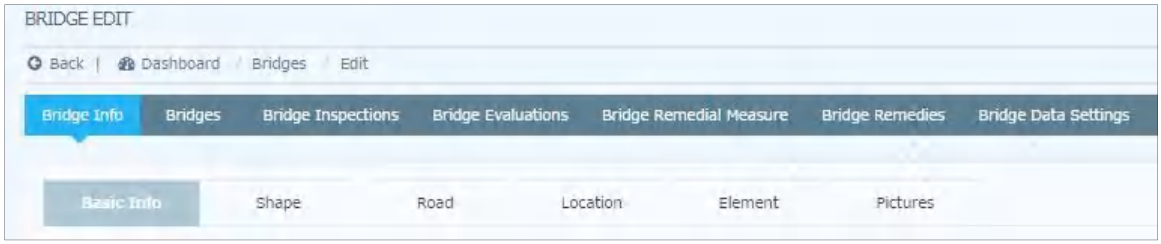
  BMS requires some length information like as "height of main girder, width of main girder, interval of main girders" to calculate rough cost estimate.
  Because of difficulty to approach to the main girder, it may be impossible to get the length information. However without the length data, BMS can't calculate it.
  If you judge impossible to get the length information, you can use temporary data base on formula shown in this manual.

  e.g. Height of Main Girder / Width of Main Girder / Interval of Main Girders
  Width of Culvert / Height of Side Wall

Chapter 4. Temporary input to create Blank inspection sheet

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

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



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

*1. Bridge NO.**

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

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

[Temporary Input]

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

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

*2. Bridge Name**

Bridge Name should be inputted following rule.

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

[Temporary Input]

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

*3. Bridge Type**

Choose a type of the bridge.

[Temporary Input]

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

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

Note

If you refer data of BMMS (old system),

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

4. Completion Year

Input year to complete building the bridge.

[Temporary Input]

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

5. Reconstruction Year

If the bridge was rebuilt, input year to complete rebuilding the bridge.
If the bridge has not rebuilt, this cell should be blank.
If you don't have the information, this cell should be blank.

6. Design Standard

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

7. Design Load

Design Load is maximum load of vehicles in design the bridge.
If you don't have the information, this cell should be blank.

8. Load Restriction (ton)

Load Restriction is set to control heavy vehicles because of damage of the bridge.
If you don't have the information or no restriction, this cell should be blank.

9. Crossing & Public Utility

After choosing crossing condition under the bridge from pull-down menu, new cell to input information of the crossing condition is created automatically. Input the information.
If the bridge has public utility like as gas, water or electricity, input it by same operation. You can input multiple items. If you don't have the information, this cell should be blank.

*10. Crossing under Bridge**

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

[Temporary Input]

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

11. Bridge Owner

Input owner name like as RHD office name.
If you don't have the information, this cell should be blank.

12. Description

Input explanation of the bridge, if it is necessary.

Public View

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

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

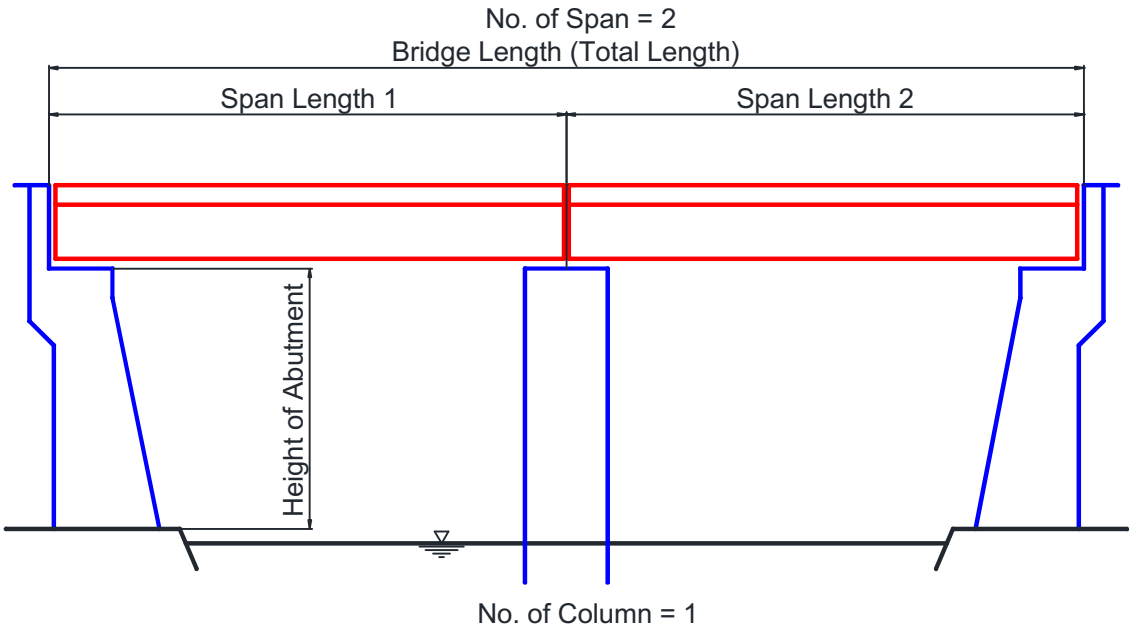
1. Bridge Length, 4. No. of Span*,*
5. Input Span Length and 6. Span Arrangement

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

[Temporary Input]

If you don't have the information,

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



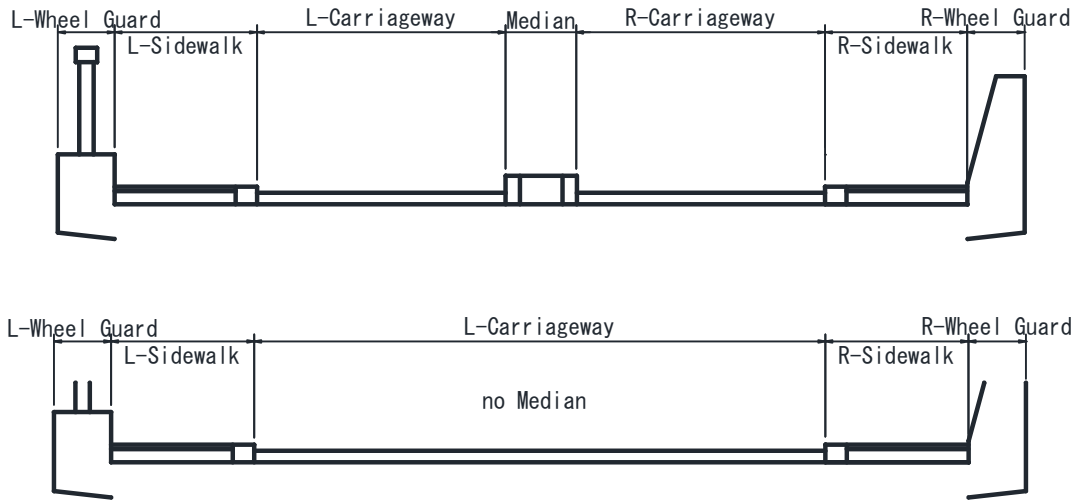
7. No. of Column, 8. Column Width and 9. Height of Abutment

Input shape of substructure.

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

2. Bridge Width, 3. Bridge Effective Width*,*
11. Median, 12(13). L(R)-Wheel guard, 14(15). L(R)-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) and
23. Width of Main Girder (except Culvert Bridge)

Input shape of Main Girder.
Each item shows different length by bridge type. Refer following figures.

*[Temporary Input **before 1st Site Inspection**]*
If you don't have the information, this cell should be blank.

*[Temporary Input **after 1st Site Inspection**]*
It may be impossible to measure some length, because of inspector can't approach it.
In that case, the length should be guessed based on photos.
If you can't get the length yet, input temporary figure in Chapter 5.

10. Skew Angle Degree

Input angle of "parapet wall" and "direction of traffic".

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

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

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

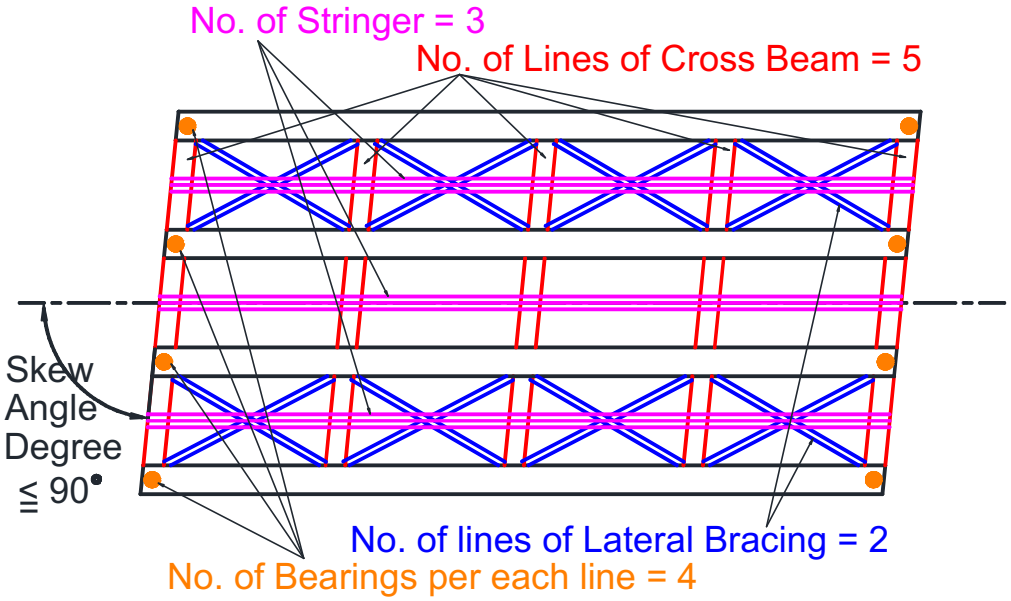
25. No. of Lines of Stringer (Steel Girder Bridge)

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

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

Input number of each lines if the element exists.

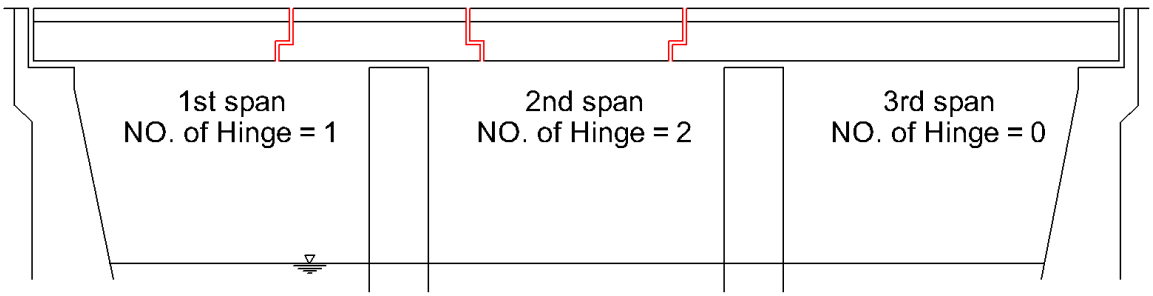
If you don't have the information, this cell should be blank.



26. NO. of Hinge

Input number of the Gerber hinge for each span.

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



< **Shape**: for Box Culvert >

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

Refer < **Shape**: for Bridge >.

*4. No. of Span**

[Temporary Input]

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

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

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

Refer < **Shape**: for Bridge >.

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

Input shape of Box Culvert.

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

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

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

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

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

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

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

< **Road** : for Bridge / Box Culvert>

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

Input information of the road.

You always have these info.

4. LRP Name

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

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

5. New LRP Name

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

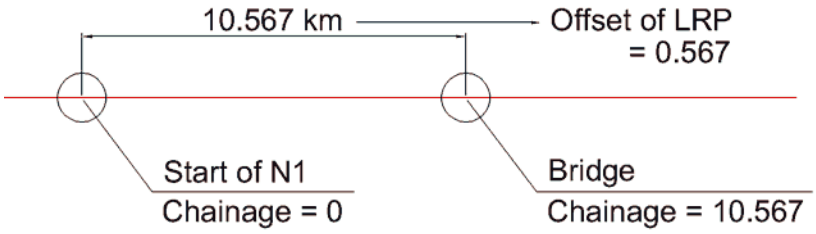
If you don't have the information, this cell should be blank.

6. Offset of LRP and 7. Chainage

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

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

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



8. Number of Lanes

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

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

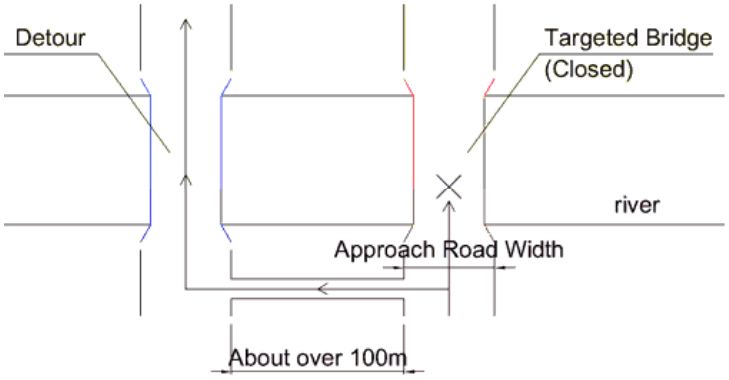
9. Approach Road Width

Input width of approach road of the bridge.

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

*10. Detour/Alternate Route**

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



Ex.
When targeted bridge is closed, user can use another bridge as Detour.
In this case, importance degree will be set as lower.

[Temporary Input]

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

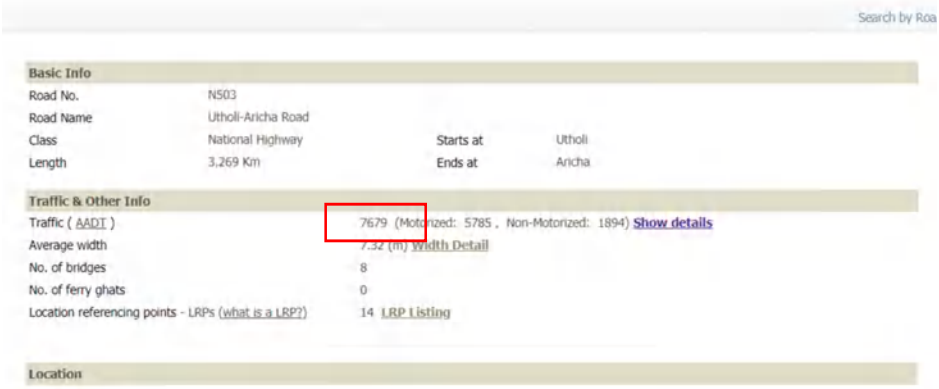
*11. Traffic Volume**, *12. Heavy Vehicle Traffic Rate* and *13. Census*

Choose range of Traffic Volume of the bridge.
This volume shows AADT (Annual Average Daily Traffic).

Note

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

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



4. Choose link No. nearest to targeted bridge and check most right column, "Traffic(AADT)"

- Heavy Vehicle Traffic Rate is calculated as
  " {AADT – (total number of truck and bus)} / AADT " (Micro bus is not including)
- Census is year of last inspection of traffic volume
  Census is survey year of each traffic data. If you don't know, keep blank.

< **Location**: for Bridge / Box Culvert>

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

Choose division information of the bridge.
You always have these info.

*5. SAE**

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

[Temporary Input]
If you don't have this information, you can choose SO-1 temporally

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

Input location of the bridge.
First letter of each word is Capital letter. You can't use Capital letter except them.
If you don't have the information, this cell should be blank.

11. GPS Latitude, 12. GPS Longitude

Input GPS information of the bridge.
They should be inputted as "xx Degree xx Minute xx Second"".

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

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

< **Element** >

If you don't know the information of each Element, refer following table.

- "Girder Bridge" in following table includes "RC / PC / Steel Girder bridge, Box girder bridge, RC slab bridge, Rigid frame bridge and Small slab bridge".
- "Truss Bailey" in following table includes "Truss PSB".
- "Culvert" in following table includes "Box Culvert".

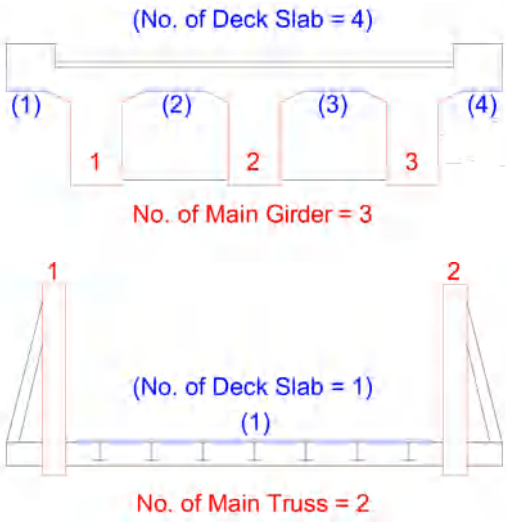
Super-structure

*PSB means Portable Steel Bridge

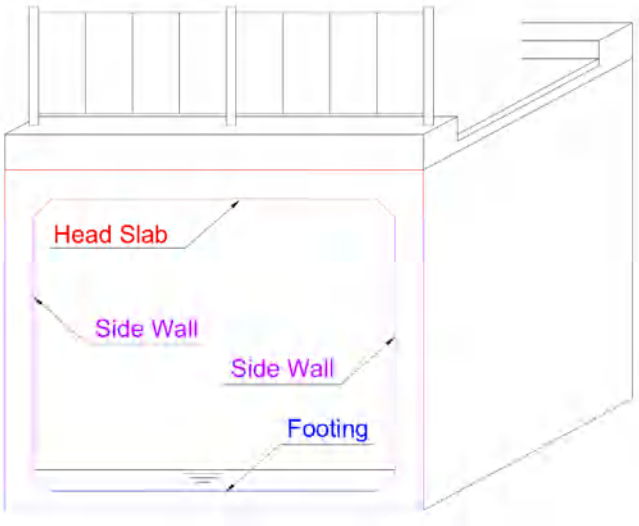
Element		Temporary Parameter	Temporary Number of the Element				Remarks
			Girder Bridge	Truss PSB*	Masonry Arch	Culvert	
1	Main Girder	-	6	-	-	-	
2	Main girder Hinge	-	-	-	-	-	no need for temporary
3	Cross Beam	-	only click on Checkbox	only click on Checkbox	-	-	number has set in "Shape" no need to input figure
4	Stringer	-	-	6	-	-	
5	Deck Slab (Concrete)	Concrete	*Remarks*	-	-	-	*= No. of Main Girder + 1*
6	Main Truss	-	-	2	-	-	
7	Arch Rib	-	-	-	1	-	
8	Outer Cable	-	-	-	-	-	no need for temporary
9	Main Tower	-	-	-	-	-	no need for temporary
10	Head Slab	-	-	-	–	1	
11	Lateral Bracing	-	-	-	-	-	no need for temporary
12	Deck Slab (PC)	-	don't use	-	-	-	use "Deck Slab (Concrete)"
13	Deck Slab (Steel)	Steel	*Remark*	-	-	-	*= No. of Main Girder + 1*

Basic Shape of Girder Bridge / Bailey Bridge / Culvert

Girder Bridge (RC)



Portable Steel Bridge



Culvert

Sub-structure

Element		Temporary Parameter	Temporary Number of the Element				Remark
			Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
14	Pier	Unknown	-	-	-	-	un-editable
15	Abutment	Unknown	-	-	-	-	un-editable
16	Foundation	Unknown	-	-	-	-	un-editable
17	Wing Wall	-	-	-	-	-	no need to input
18	Footing	-	-	-	-	1	
19	Side wall	-	-	-	-	2	

Bearings

Element		Temporary Parameter	Temporary Number of the Element				Remark
			Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
20	Bearing (Steel)	Steel	only click on Checkbox	only click on Checkbox	-	-	un-editable
21	Bearing Seat/Bed	-	-	-	-	-	un-editable
22	Bearing (Rubber)	Rubber	-	-	-	-	un-editable

Deck Surface

Element		Temporary Parameter	Temporary Number of the Element				Remark
			Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
23	Railing (Steel)	Steel	2	2	2	2	
24	Pavement	Asphalt	-	-	-	-	un-editable
25	Wheel Guard	-	2	2	2	2	
26	Railing (Concrete)	-	-	-	-	-	no need for temporary
27	Curb	-	-	-	-	-	no need for temporary

Other Elements

Element		Temporary Parameter	Temporary Number of the Element				Remark
			Girder Bridge	Truss Bailey	Masonry Arch	Culvert	
28	Drainage System	-	1	1	1	1	
29	Inspection Facilities	-	-	-	-	-	no need for temporary
30	Road sign	-	-	-	-	-	no need for temporary
31	Utility Pipe	-	-	-	-	-	no need for temporary
32	Lighting Facility	-	-	-	-	-	no need for temporary
33	Bridge Approaches	-	-	-	-	-	un-editable
34	Expansion Joint(Rubber)	-	-	-	-	-	
35	Expansion Joint(Steel)	-	only click on Checkbox	only click on Checkbox	-	-	un-editable
36	Retaining Wall	-	only click on Checkbox	only click on Checkbox	only click on Checkbox	only click on Checkbox	un-editable

---

< **Pictures** : for Bridge / Box Culvert>

No need to upload pictures before 1st Periodic Inspection.

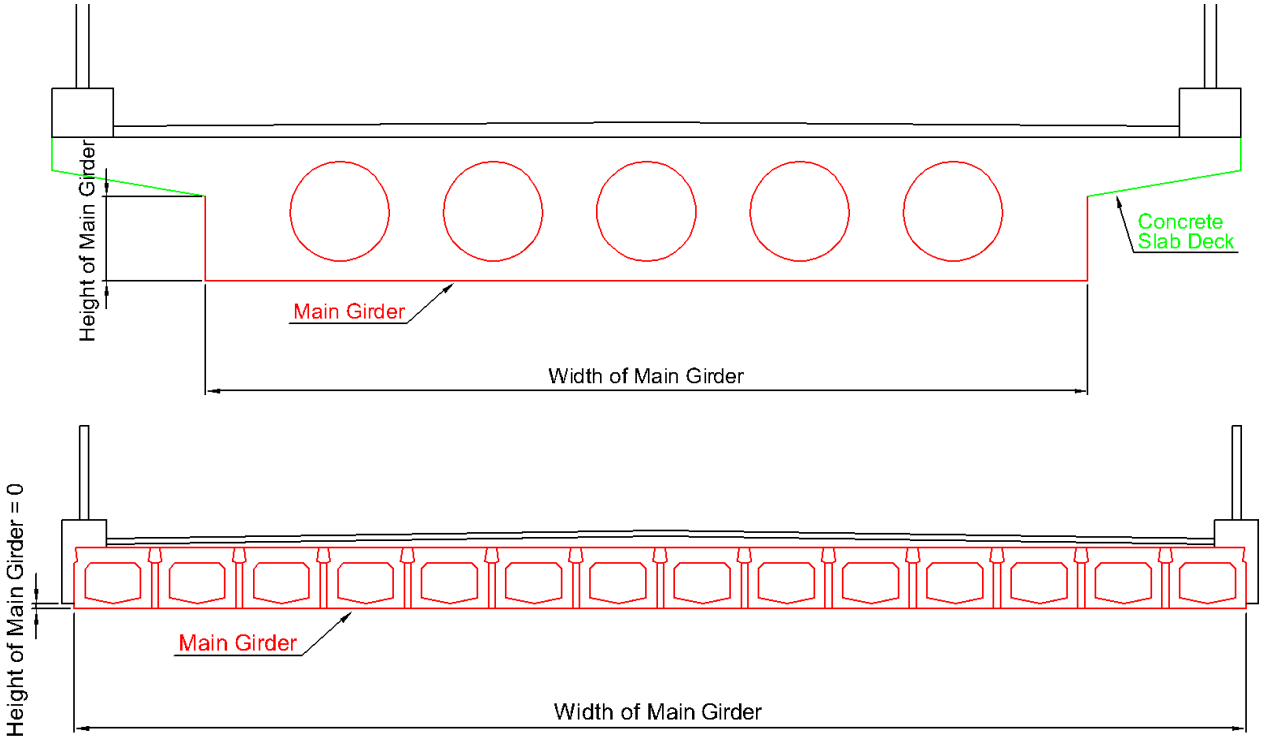
Chapter 5. Temporary input because of impossibility to get the information

This chapter shows formula to calculate temporary length of main girder or box culvert.
You can refer this chapter only if you completely unable to get length information in bridge site.

Only for popular bridge type in Bangladesh, this manual shows formula.

The length calculated with formula should be rounded up by first decimal place. e.g. 3.500 m

[Small Slab Bridge / RC Slab Bridge]



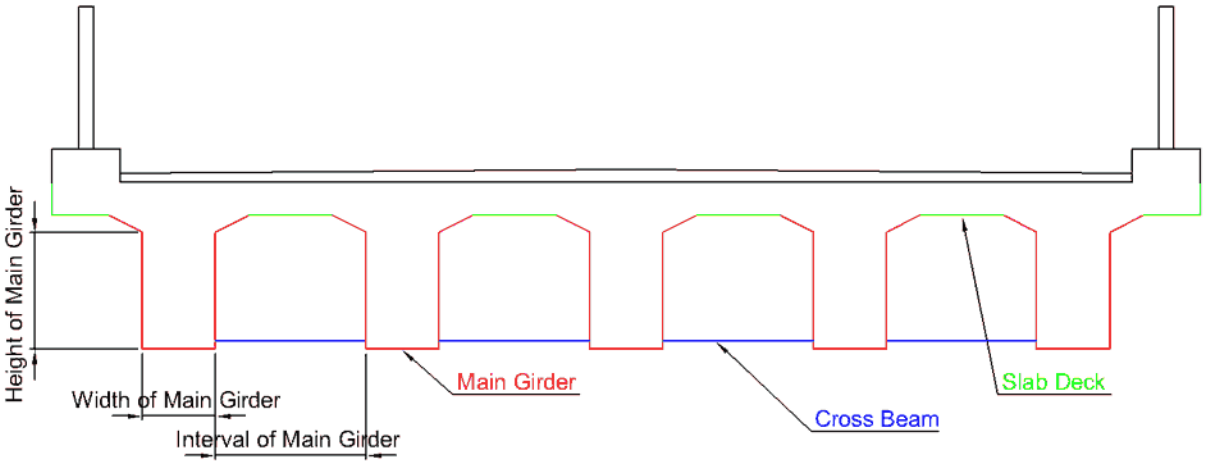
- Interval of Main Girder : input always "0".
- Height of Main Girder : Temporary = "0"
- Width of Main Girder : Temporary = "Effective Width"

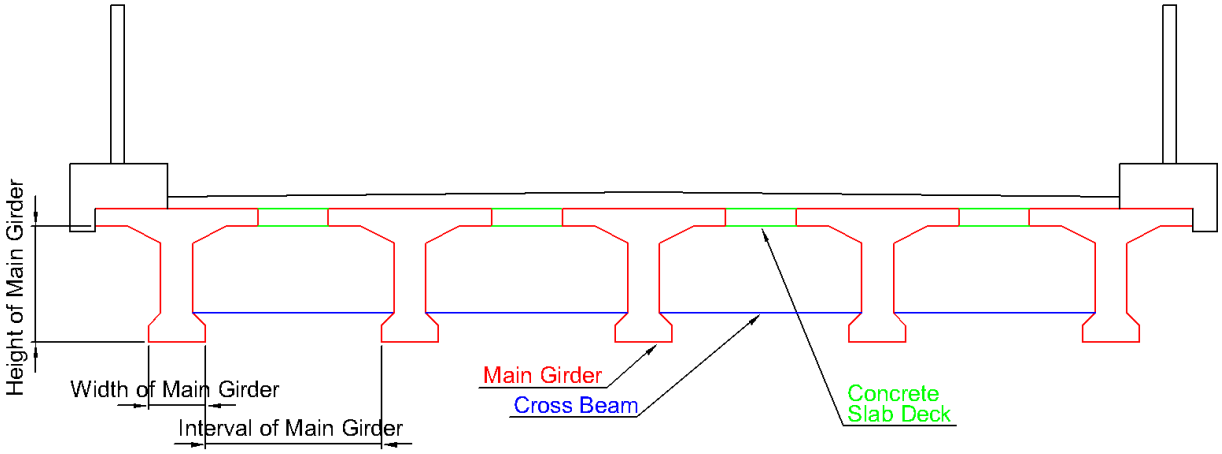
e.g. Temporary input case

If Effective width = 7.500m,

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

[RC Girder Bridge / PC Girder Bridge]





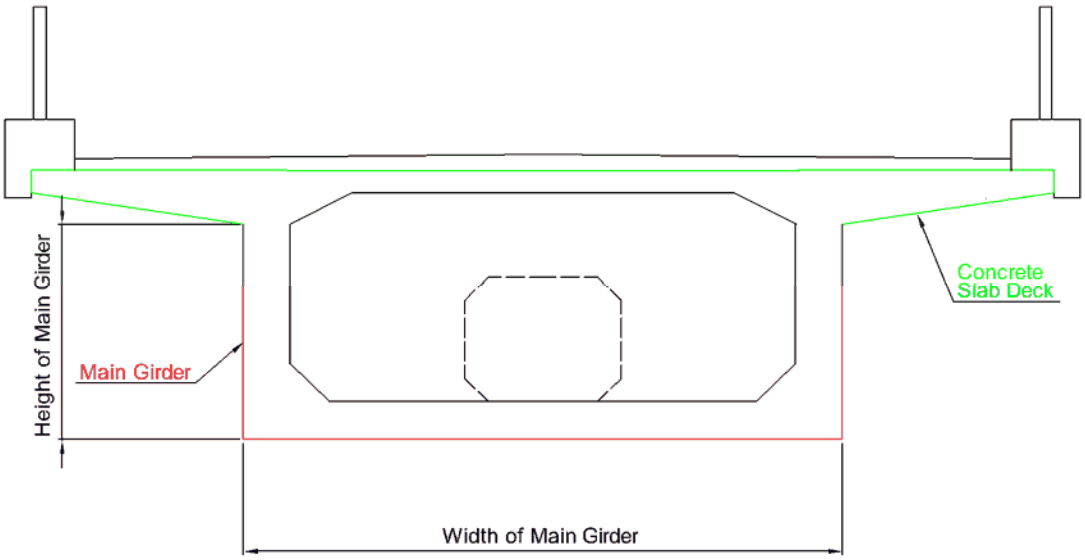
- Interval of Main Girder : Temporary = “Effective Width” / (“NO. of Main Girder” - 1)
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = 0.300 m

e.g. Temporary input case

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

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

[RC Box Girder Bridge / PC Box Girder Bridge]



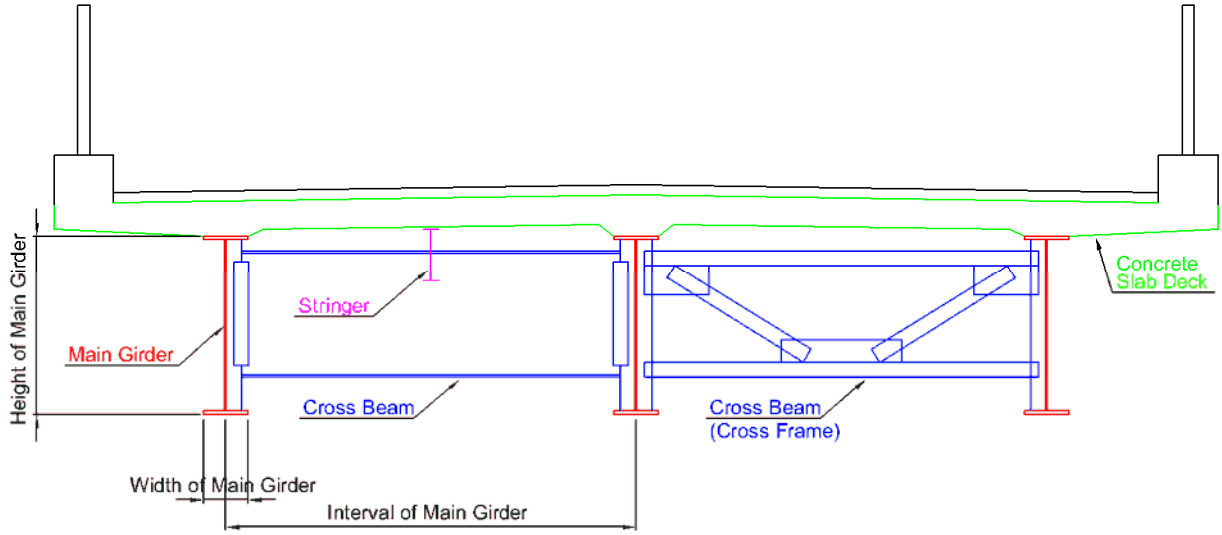
- Interval of Main Girder : input always "0"
- Height of Main Girder : Temporary = "Span Length" / 15
- Width of Main Girder : "Effective Width"

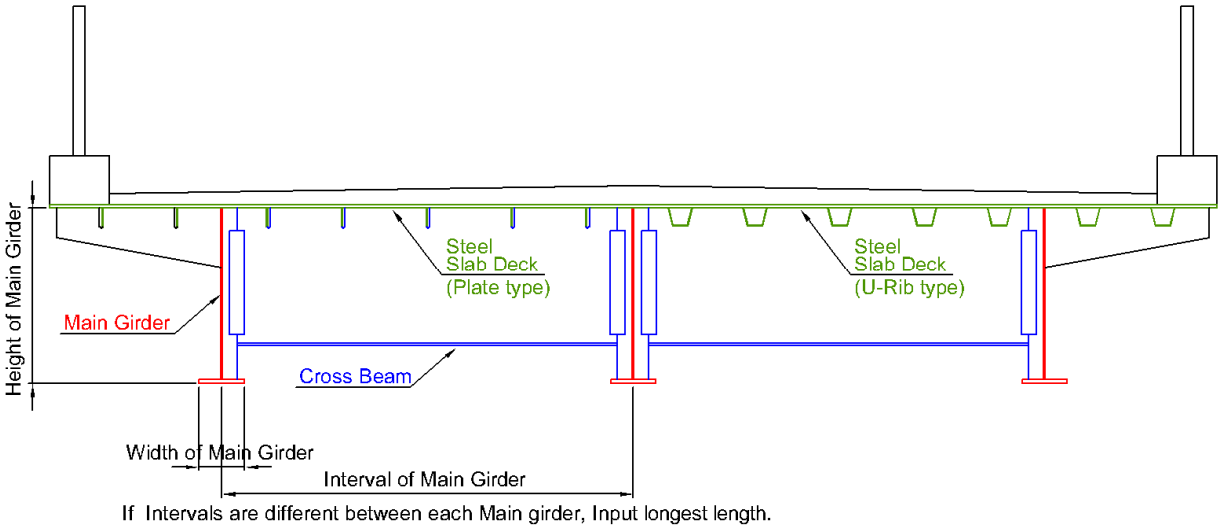
e.g. Temporary input case

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

- Interval of Main Girder = 0.500m : always
- Height of Main Girder = 30.000m / 15 = 2.000m : temporary
- Width of Main Girder = 10.000m : temporary

[Steel Girder Bridge]





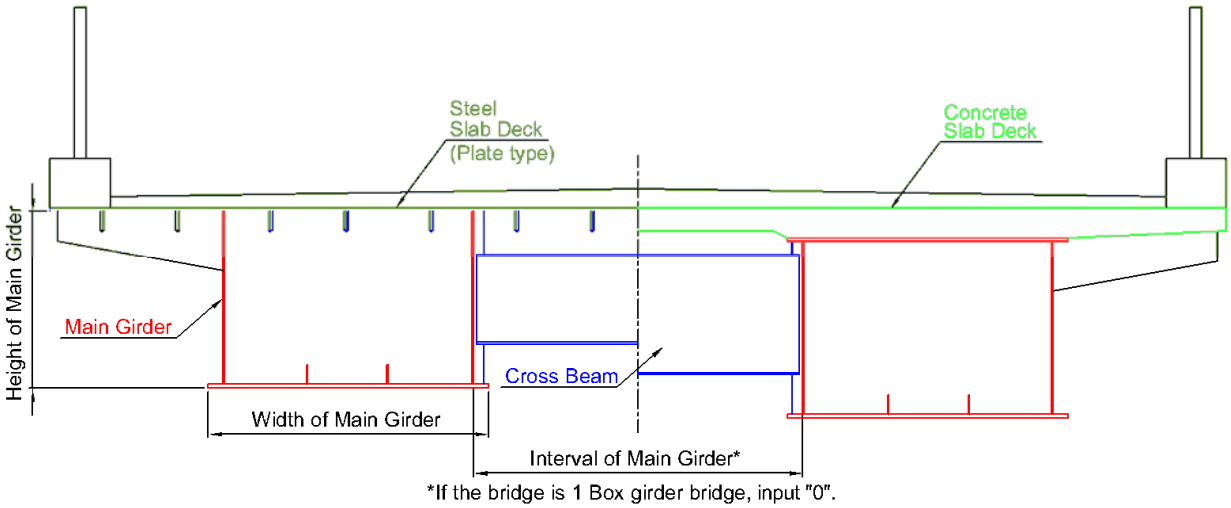
- Interval of Main Girder : Temporary = “Effective Width” / “NO. of Main Girder”
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = “Height of Main Girder” / 5

e.g. Temporary input case

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

- Interval of Main Girder = 7.500m / 3 = 2.500m : temporary
- Height of Main Girder = 30.000m / 15 = 2.000m : temporary
- Width of Main Girder = 2.000m / 5 = 0.400m : 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 = 30.000m / 15 = 2.000m : temporary
- Width of Main Girder = 2.500m : temporary
- Interval of Main Girder = 10.000m - 2.500m x 2 = 5.000m : temporary

(Single box girders bridge)

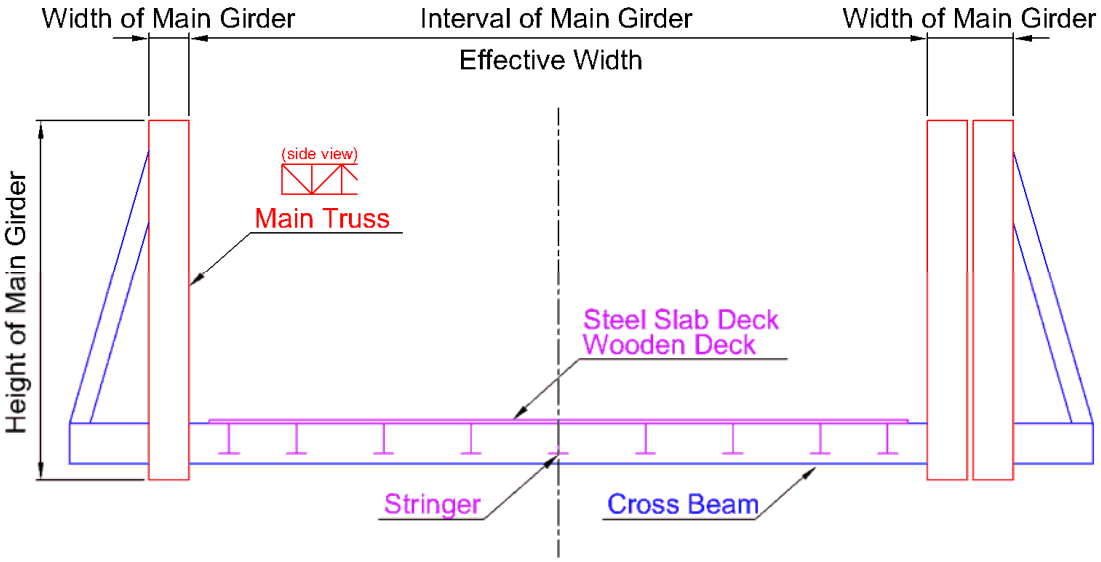
- Height of Main Girder : Temporary = “Span Length” / 15
- Width of Main Girder : Temporary = “Effective Width”
- Interval of Main Girder : input always “0”

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 = 30.000m / 15 = 2.000m : temporary
- Width of Main Girder = 7.500m : temporary
- Interval of Main Girder = 0.000m : temporary

[Truss Bridge / Portable Steel Bridge]

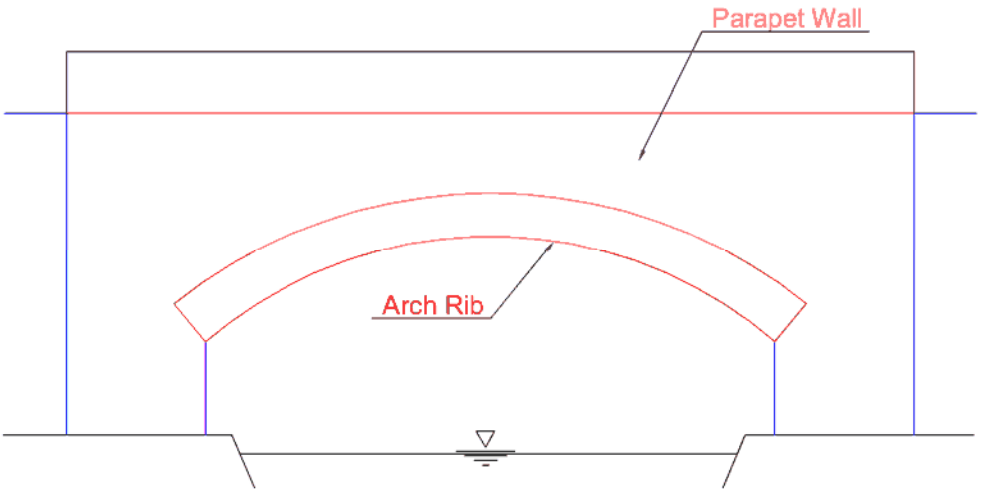


- Interval of Main Girder : always same as "Effective Width".
- Height of Main Girder : Temporary = 2.000 m
- Width of Main Girder : Temporary = 0.200 m

[Masonry Arch Bridge]

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

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



[Mixed Types Bridge]

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

- The bridge consists of multiple types of bridge.

e.g.

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

- The bridge consists of multiple materials.

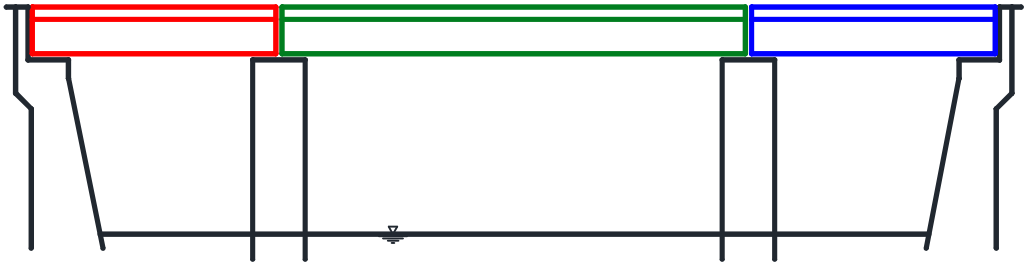
e.g.

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

- The bridge consists of multiple types and materials.

e.g.

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



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

Note

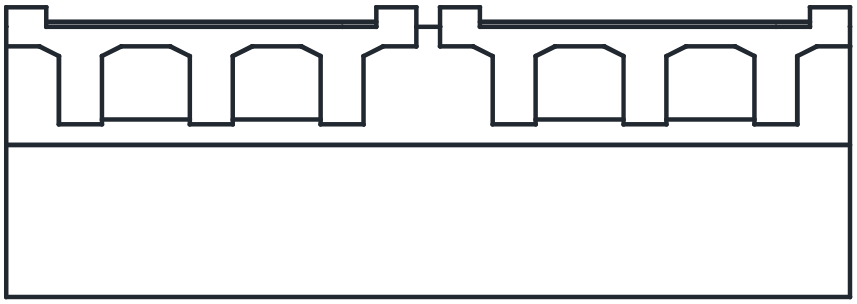
- Number of Main Girder, cross beam and so on of Basic Data should be inputted as maximum number of main girder in all spans.
- Inspection sheet and Evaluation sheet of Mixed Types Bridge consist of "All types of defects" (both of types of defects of "Concrete" or "Steel (rubber)".

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

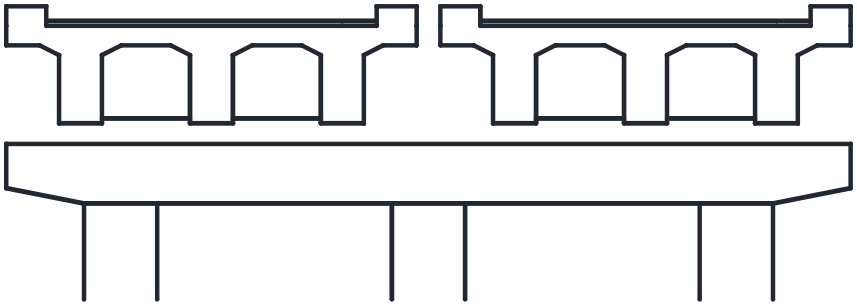
  Cells of evaluation sheet not required (e.g. concrete defect of steel element) should be inputted as "N".

[How to input Parallel bridge sharing one substructure]

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



e.g. One Abutment with parallel bridges



e.g. One Pier with parallel bridges

How to input the parallel bridges is shown as following.

- Parallel bridges should be registered as **TWO bridges**. (separated bridges)
- Bridge No. is inputted as following,

  Bridge locating upstream side : 12 letters (by GPS) + **1 (13th letter)**

  Bridge locating downstream side : 12 letters (by GPS) + **2 (13th letter)**

- Each substructure should be inspected as **ONE component**. However, BMS requires result of superstructure and substructure. Therefore, inputting result should be carried out as following,

  Bridge locating upstream side

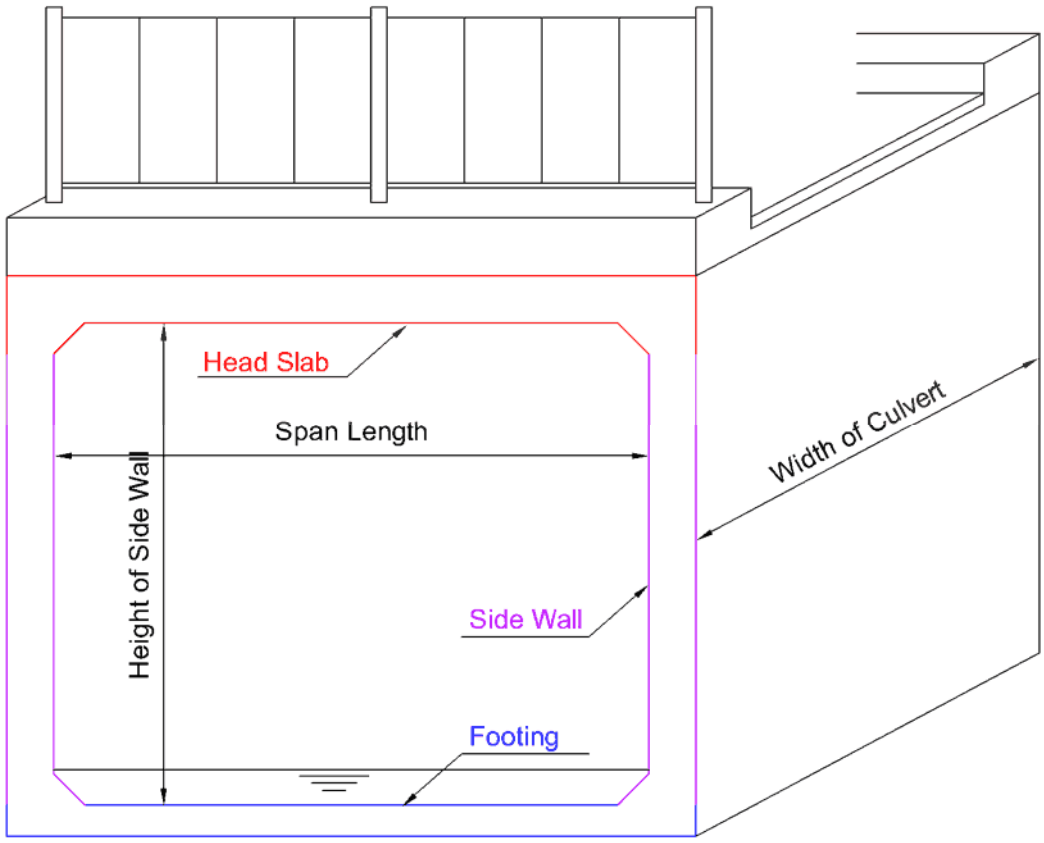
  : Result of the superstructure of upstream side + **Result of the substructure***

  Bridge locating downstream side

  : Result of the superstructure of downstream side + **Result of the substructure***

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

[Box Culvert]



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

e.g. Temporary input case

If Bridge width = 7.500m,

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

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