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

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

#### 6.1 Flowchart of BMS in Periodic inspection

Following flowchart shows step of BMS management

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



- SAE : Sub Assistant Engineer
- SDE : Sub Divisional Engineer

#### 6.2 Login



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

1. Enter valid Employee ID

#### 2. Enter Password

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

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

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

BMS LOGIN	PASSWORD CHANGE REQUEST
1 Employee ID	Employee ID
Password Remember me	Email
LOGIN Forgotten password?	SEND Log in

#### 6.3 Dashboard D-Entry D-Check Committee Svs. Admir r.Inspect Public Chief Insp. Inspector Ad Ad DASHBOARD ιΞ Co 2 CONCRETE STEEL BRIDGE MASONRY TOTAL BOX D BRIDGE CULVERT BRIDGE BRIDGE CONDITION æ 00307 00112 00165 00028 00001 00014 E Bridge Lie Bar chart: Inspection and Evaluation 4 Pie Chart: Bridge Category 3 Ä 140 120 C: 5 D: 12 100 2 80 60 40 20 Oct - Dec Jul - Sep Apr Bridge Remedy Integrated List

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

 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  $\mathbf{x}$  button. To re-enable that section follow the steps in number 1 (Configuration).

#### 6.4 Input and Browsing of Basic Data

6.4.1. Outline of "	Bridge List" page	Sys. Admin D-Entry D-Check Committee
		Inspector Sr.Inspector Evaluator Chief Insp. Public
BRIDGE MANAGEME	ENT SYSTEM (BMS)	🕒 Admin 🗸
-	BRIDGE LIST	6 Configuration
	🕼 Back I 🎪 Dashboard / Bridges	
	Bridges Bridge Inspections Bridge Evaluations Bridge Remedial Measure Bridge Remedies	Bridge Data Settings
🚯 Dashboard	6 4 3	
≣ Bridge List	Finel Need Cross Checking 1 Draft 1	
Pridge Inspection	Bridge List	
A Bridge Evaluation		8 Export + Add New
Bridge Remedial Measure	Filter -	
Bridge Remedy List	<b>a</b>	10
🚔 Settings >	Records per page 10	Search: ws
🖋 Tools	11 SI Action Map Basile Bridge Bridge Road Zone Circ	cle Division Sub Total Bridge Division Length Width
Activity Log	🗌 1 👁 🕼 😭 📔 💡 📑 Sample for WS Bridge Steel Girder Bridge with Concrete Deck N1 Dhaka Dha	aka Dhaka Sub-Division-1, Dhaka 3, 12 5.3
		Durlan d Nat
	Showing 1 to 1 of 1 entries	Previous 1 Next
		13

- 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.

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## 6.4.2. Preparation to input Basic Data

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

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

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

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

#### Case of adding new bridge into BMS

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

BRIDGE MANAGE	MENT	SYS	IEW (BI	NS)									() N	Ir. Data Entry	Operator `
	BRID	DGE LIS	ST											c	onfiguration
	<b>G</b> Ba	ack I 6	Dashboard	/ Bri	dges										
Contraction of the second	E	Bridges													
Dashboard															
E Bridge List			Final	Nee	ed Cross Ch	necking 2	Draft 2	D							
	Br	ridge	List												
														Export	+ Add New
		Filter -											_		
		Records	per page	50									Search:	dhaka	
		SI	Action	Мар	Basic Data	B	idge ame		Bridge Type	Road No	Zone 🖕	Circle 🖕	Division	Sub Division	Span Length
	C	1	۲	9		Amtola	Bailey Bridge		Potable Steel Bridge	R315	Dhaka	Dhaka	Manikganj	Nayarhat	1
	C	2	۲	9		Amte	a Bridge		Masonry Arch Bridge	R315	Dhaka	Dhaka	Manikganj	Nayarhat	1
	C	3	۲	0		Arongol	ad Culvert-1		Box Culvert	R504	Dhaka	Dhaka	Manikganj	Manikganj	10
	C	4	۲	9		Arongol	ad Culvert-2		Box Culvert	R504	Dhaka	Dhaka	Manikganj	Manikganj	5.63

#### <u>Note</u>

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

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

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

#### < Bridge Data tab >

	Shape	Road		Loc	cation	Element	Pictures
Bridge No*			2. Bridge No	ame*			
If you don't know, refer Te	emporary input rule i	n manual	If you dor	n't know,	refer Tempor	ary input rule in manual	
.g. GPS lat:12d34m05s lor	1:98d76m50s > 234	0587650	First letter o	f each w	ord is Capital	Letter	
. Bridge Type*			4. Completie	on Year	<b>611</b>		
Select			If you dor	't know,	input as 2050		
you don't know, refer Tem	porary input rule in r	nanual					
. Reconstructed Year 🛗			6. Design S	tandard			
If you don't know, keep bl	lank		- Select				-
			If you don't	know, ke	ep blank		
. Design Load			8. Load Res	triction			
If you don't know, keep bl	lank		If you dor	n't know,	keep blank		
. Crossing & Public Utility			10. Crossing	g Under	Bridge*		
Select			- Select				-
you don't know, no need t	o choose		If you don't	know, In	put as "Unkno	wn" (modify after inspection	on)
1. Bridge Owner							
If you don't know, keep bl	lank						
2. Description							
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BISI <sub>x</sub>							
B I S I <sub>x</sub>							
B I S I <sub>x</sub> I							
B I <del>S</del> I <sub>x</sub> I							
■ I S I <sub>x</sub> I							

#### <u> 1. Bridge NO. \*</u>

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

- > GPS Latitude : <u>12</u> degree <u>34</u> minute <u>56</u> second
   GPS Longitude : <u>98</u> degree <u>76</u> minute <u>54</u> 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, 13<sup>th</sup> 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 13<sup>th</sup> letter. If down scream side, "2".

#### <u> 2. Bridge Name\*</u>

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

#### <u> 3. Bridge Type\*</u>

Choose a type of the bridge.

#### <u>Note</u>

If you refer data of BMMS (old system),

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

#### 4. Completion Year

Input year to complete building the bridge.

#### 5. Reconstruction Year

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

#### <u>6. Design Standard</u>

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.

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

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.

#### <u> 11. Bridge Owner</u>

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

#### 12. Description

Input explanation of the bridge, if it is necessary.

#### Public View

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

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

#### < Shape tab >

a. Bridge Langth (m)*       2. Bridge Width (m)*         If you don't know, input as 999.000 (modify after inspection)       If you don't know, input as 999.000 (modify after inspection)         a. Bridge Effective Width (m)*       If you don't know, input as 999.000 (modify after inspection)         nput to three decimal places (e.g. 12.000)       4. No. of Span*         Bridge Effective Width (m)*       If you don't know, input as 999.000 (modify after inspection)         nput span length       C2         Span Arrangement       6. Span Arrangement         mut span length for each span. This cell shows total length after inspection)       If you don't know, keep blank         my ou don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         my ou don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         my ou don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         my ou don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         my ou don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         my ou don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         my ou don't know, keep blank (input after inspection)       If you don't know, keep blank (i	spection)
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9. Skridge Effective Width (m)*       4. No. of Spar*         If you don't know, input as 989.000 (modify after inspection)       If you don't know, refer Temporary input rule in maintenance (e.g. 12.000)         9. And three decimal places (e.g. 12.000)       6. Span Arrangement         9. And on't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         11 you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         12 wheel Guard - L (m)       If you don't know, keep blank (input after inspection)         13. Wheel Guard - L (m)       If you don't know, keep blank (input after inspection)         14. Vand don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         14. You don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         15. Carriage way-R (m)       If you don't know, keep blank (input after inspection)         16. Vandon't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         17. No. of Sidewalk       If you don't know, keep blank (input after inspection)         17. You don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         18. Sidewalk-R (m)       If you don't know, keep blank (input after inspection)         19. You don't know, keep blank (inp	nual
If you don't know, input as 999.000 (modily after inspection)         mput to three decimal places (e.g. 12.000)         3. Input Span Length         Column         If you don't know, refer Temporary input rule in main matching to three decimal places (e.g. 12.00)         5. No. of Column         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspe	nual
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7. No. of Column       8. Column Width (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         9. Height of Abutment (m)       10. Skew Angle Degree         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         nput to three decimal place (e.g. 12.00)       12. Wheel Guard -L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         nput to three decimal places (e.g. 12.000)       14. Carriage way-L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         nput to three decimal places (e.g. 12.000)       14. Carriage way-L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         nput to three decimal places (e.g. 12.000)       16. Lanes On Structure         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         nput to three decimal places (e.g. 12.000)       18. Sidewalk-L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         nput to three decimal places (e.g. 12.000)       20. No. of Main Girder for Girder Bridge comes from Brid         1	
If you don't know, keep blank (input after inspection)       If you don't know, keep blank         If you don't know, keep blank (input after inspection)       10. Skew Angle Degree         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       11. Median (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after ins	
a. Height of Abutment (m)       Input to one decimal place (e.g. 12.0)         b. Height of Abutment (m)       10. Skew Angle Degree         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         input to three decimal places (e.g. 12.00)       12. Wheel Guard -L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         input to three decimal places (e.g. 12.000)       14. Carriage way-L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         input to three decimal places (e.g. 12.000)       14. Carriage way-L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         invo value for Median first, then this field will be enabled       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         input to three decimal places (e.g. 12.000)       20. No. of Main Girder of Girder Bridge         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         input to three decimal places (e.g. 12.000)       20. No. of Main Girder of Girder Bridge comes from Brid         11. Interval of Main Girders (m)       If you c	
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Input to one decimal place (e.g. 12.0)         No need to input after the decimal point (e.g. 90)         If you don't know, keep blank (input after inspection) <tr< td=""><td>n)</td></tr<>	n)
11. Median (m)       12. Wheel Guard -L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         Input to three decimal places (e.g. 12.000)       14. Carriage way-L (m)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)       If you don't know, keep blank (input after inspection)         If you don't know, keep blank (input after inspection)	
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If you don't know, keep blank (input after inspection)	
No. of Hinge for Girder Bridge comes from Bridge Ele	
	ment
27. No. of Bearings per each line     28. No. of lines of Lateral Bracing	ment
If you don't know, refer Temporary input rule in manual If you don't know, keep blank (input after inspection	ment
Public View	)
	nent
Save Reset	)

<u>Note</u>

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

<u>1. Bridge Length\*</u>, <u>4. No. of Span\*</u>, <u>5. Input Span Length</u> and <u>6. Span Arrangement</u>

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

Span-1	Span-2	
25.000	35.000	



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

Input shape of substructure.

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



Input width of the bridge referring follow a figure.

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



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

Input shape of Main Girder.

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

[Temporary Input after 1<sup>st</sup> Periodic Inspection of the bridge]

It may be impossible to measure some length, because of inspector can't approach it. In that case, the length should be guessed based on photos. *If you can't get the length yet, input temporary figure as following.* 

#### [Small Slab Bridge / RC Slab Bridge ]





<ul> <li>Interval of Main Girder</li> </ul>	: 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,

$\triangleright$	Interval of Main Girder	= 0.000 m	: always
≻	Height of Main Girder	= 0.000m	: temporary

➢ Width of Main Girder = 7.500m ∶ temporary





- 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,

۶	Interval of Main Girder	= 10.000m / (5-1) = 2.500m	: temporary
۶	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,

۶	Interval of Main Girder	= 0.500 m	:	always
$\triangleright$	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
 Width of Main Girder = 7.500m
 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.

1<sup>st</sup> span : RC Girder Bridge, 2<sup>nd</sup> span : PC Box girder Bridge, 3<sup>rd</sup> span : RC Girder Bridge

> The bridge consists of multiple materials.

e.g.

1<sup>st</sup> span : RC Girder Bridge, 2<sup>nd</sup> span : Steel Girder Bridge, 3<sup>rd</sup> span : RC Girder Bridge

> The bridge consists of multiple types and materials.

e.g.

1<sup>st</sup> span : RC Girder Bridge, 2<sup>nd</sup> span : Steel Box Girder Bridge, 3<sup>rd</sup> span : RC Slab Bridge



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

<u>Note</u>

- 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".

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



e.g. One Abutment with parallel bridges



e.g. One Pier with parallel bridges

How to input the parallel bridges is shown as following.

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

Bridge locating upstream side: 12 letters (by GPS) + 1 (13th letter)Bridge locating downstream side: 12 letters (by GPS) + 2 (13th letter)

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

Bridge locating upstream side

: Result of the superstructure of upstream side + **Result of the substructure\*** Bridge locating downstream side

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

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

21. Width of Culver(Box Culvert)22. Height of Side Wall(Box Culvert)

Input shape of Culvert.

[Temporary Input after 1<sup>st</sup> Periodic Inspection of the bridge]
It may be impossible to measure some length, because of inspector can't approach it.
In that case, the length should be guessed based on photos.
<u>If you can't get the length yet, input temporary figure as following.</u>

[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 = 2.000 m

: temporary

#### 10. Skew Angle Degree

Input angle of "parapet wall" and "direction of traffic". Skew angle of bridges are mainly 90° (straight bridge).

24. No. of Lines of Cross Beam	(except Box Culvert)
25. No. of Lines of Stringer	(Steel Girder Bridge)
27. No. of Bearings per each line	(except Box Culvert)
28. No. of Lines of Lateral Bracing	(Steel Girder Bridge)

Input number of each lines if the element exists.



#### 26. NO. of Hinge

Input number of the Gerber hinge for each span.



#### <Road tab>

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

#### <u>1. Road Class\*, 2. Road No.\*</u> and <u>3. Road Name</u>

Input information of the road.

#### 4. LRP Name

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

#### 5. New LRP Name

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

#### 6. Offset of LRP and 7. Chainage

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

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



#### 8. Number of Lanes

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

#### 9. Approach Road Width

Input width of approach road of the bridge.

#### 10. Detour/Alternate Route\*

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



#### 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).

<u>Note</u>

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).

					Searc	h by R
Basic Info						
Road No.	N503					
Road Name	Utholi-Aricha Road					
Class	National Highway	Starts at	Utholi			
Length	3.269 Km	Ends at	Aricha			
Traffic & Other Info Traffic ( <u>AADT</u> ) Average width	[	7679 (Motorized: 5785, No 7.32 (III) width Detail	n-Motorized:	1894) <u>Show details</u>		
No. of bridges		8				
No. of ferry ghats		0				
Location referencing p	oints - LRPs ( <u>what is a LRP?</u> )	14 LRP Listing				
Location						

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

> Heavy Vehicle Traffic Rate is calculated as

" {AADT – (total number of truck and bus)} / AADT " (Micro bus is not including)

> Census is year of last inspection of traffic volume

Census is survey year of each traffic data. If you don't know, keep blank.

#### <Location tab>

Basic Info	Shape	Road	Location	Element	Pictures
1. Zone*			2. Circle*		
- Select		-	Select		-
3. Division*			4. Sub Division*		
- Select -		-	Select		-
S. SAE			6. District		
- Select		-	If you don't know, ke	eep blank	
. Upazilla			8. Union		
lf you don't know, keep	blank		If you don't know, ke	eep blank	
9. Village			10. Country		
If you don't know, keep	blank		If you don't know, k	eep blank	
11. GPS Latitude Degree		Minute		Second	
If you don't know, keep	blank (input after	If you don't know, ke	eep blank (input after If you don't know, keep blank (input after		
2. GPS Longitude					
Degree		Minute		Second	
If you don't know, keep	blank (input after	If you don't know, ke	ep blank (input after	If you don't know, keep l	blank (input after
Reference Level					
Reference Level					
Public View					
Save R	leset				

#### <u>1. Zone\*, 2. Circle\*, 3. Division\*</u> and <u>4. Sub Division\*</u>

Choose division information of the bridge.

#### <u>5. SAE</u>\*

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

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

Input location of the bridge.

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

#### 11. GPS Latitude, 12. GPS Longitude

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

#### <u>Note</u>

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

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

#### <Element tab>

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

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

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

#### <Pictures tab>

Dable inte		Shape	Ro	bad	Location	Element	
itle•				2. 0	rder		
lax 25 charac	ters						
escription							
lax 200 chara	cters						<i>B</i>
nage* Ioose File No	Im Pre	1age view	r				
Feature Ph	oto				Public View		
checking, th me in Bridge	ls photo is List	s displayed with	mouseover the bridg	je By	r checking, this pho	oto is opened to Public User	
Save	Re	set				+ A	dd New Picture
ecords per p	age 50					Search:	
to a construction in the second	Order	Picture	Title 💧	Feature Photo	Public Access	Description	4
Action							· ·
il Action	1		test	Yes	Yes		
Action	1 1 of 1 en	etries	test	Yes	Yes	Previous	1 Next

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

#### <u> 1. Title</u>\*

Input Title of the picture,

#### <u>2. Order</u>

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

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

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

#### 3. Description

You can attach explanation for the picture.

#### 4. Image\*

By clicking the "Select a file", file browser is opened. Choose the picture and click "OK". Uploaded picture is displayed as fixed height with same ratio.

#### Note

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

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

#### Feature Photo Picture

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

#### Public View

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

Re	ecord	s per page	10				
	SI	Action	Мар	Basic Data	Bridge 🔺 Name	Bridge Picture	.RP
	1	• 7 1	9	È	Dummy 01		036

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

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

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

BRIDGE MANAGEM														Mr. Data Cr	
.=	BRID	GE LIS	ST												Configuration
	G Ba	k	🚯 Dashb	ooard /	Bridges										
	Br	idges													
🚯 Dashboard															
🔳 Bridge List		F	inal	Ne	ed Cross (	Checking 📵		one " b	oridge to	be chec	ked is s	tocked	١.		
	Bri	dge	List												
															Export
	F	iltor -													Lapore
		itter +													
	R	ecords	per page	10									Search	:	
		SI	Action	Мар	Basic Data	Bridge 🔺	Bridge Type	Road No	LRP Name	Zone	Circle	Divisio	n 🔶	Sub Division	Total Length
		1	© 2	0	2 III	Test Bridge- 12345	Box Culvert								
		howin	n 1 to 1	of 1 optr	ioc									Previous	1 Next
	3	HOWIN	IG I 10 I	of I end	ies										

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

#### 6.5 Input and Browsing of Inspection Result : Bridge Inspection

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

Following flowchart shows outline of "input" and "approval" step of Inspection result in BMS. You can refer "3.7 Bridge Inspector" to understand types of Inspector in the chart. This section shows explanation of "Periodic Inspection".



#### 6.5.1. Preparation to input Inspection Result.

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

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

BRIDGE MANAGEME	NT SYSTEM (BI	VIS)							6	Admin ~
-=	BRIDGE INSPECTION	ILIST								
	G Back I 🙆 Dashboard	d / Bridge Inspection								
	Bridges Bridge	Inspections Bridge	Evaluations Bridge	Remedial Measure	Bridge Re	medies	Bridge Da	ta Settings		
Dashboard	7	6	6	4		3		2		
Bridge List	Final	Unsigned	For Approval	Submitted For R	eview	Draft		Blank Sheet	s	
Bridge Inspection	Periodic Inspec	tion Integrated Lis	t				-		- 1	
Bridge Evaluation							12	Export	Prepare Insp	ection Sheet
Bridge Remedial Measure	Filter View	All								
Bridge Remedy List		10						-		
Settings >	Records per page	10						Se	earch: sa	
' Tools	SI Result Report Sheet Form	Bridge Name	Bridge Type	♦ Ro N	ad LRP o Name	Zone	Circle	Division	Sub-Division	Map
Activity Log	1 🖉 🗎	Sample for WS Bridge	Steel Girder Bridge with	n Concrete Deck	N1 LRP019	a Dhaka	Dhaka	Dhaka	Sub-Division-1, Dha	ika 💡
	2 🗐 🗎	Sample for JCC Bridge	Steel Girder Bridge with	Concrete Deck	R05 LRP95	a Barishal	Barishal	Barishal	Sub-Division-1, Baris	shal 💡
	Showing 1 to 2 of 2	entries							Previous	Next
	Routine Inspect	ion Integrated List						6	2	
									Prepare Insp	ection Sheet
	Filter -									
	Records per page	10						Se	earch:	
	SI Action Result Sheet	Report Bi Form N	ridge ame	Bridge Type	Road     No	LRP Zo	ne Circle	Division	Sub-Division	Map
	1 💼 📕	Jamuna Multi	-purpose Bridge 2 Baile	ey Bridge with Timber	Deck R10N2	LRP222	haka Dha	aka Dhaka	Sub-Division-1, Di	naka 💡
	Showing 1 to 1 of 1	entries						1	5 Previous	Next
										16

Sys. Admin

D-Entry

Inspector Sr.Inspecto

D-Check

Chief Insp

Committe

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.

#### 6.5.3. Step-by-step instruction for Inspector

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

<u>Note</u>

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.

#### <u>!! Only for 1st Periodic Inspection in 2018 !!</u>

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

		STEM (BN	(IS)															
	BRIDGE	E INSPECTION	Sel	ect	a bridge for inspection							×						
	O Back	I 🙆 Dashboard	• P	erioc	ic Inspection   Routine Inspecti	on												
	Bridg	ges Bridge	R	ecord	s per page 50					Search:								
🙆 Dashboard				SI	Bridge Name	Bridge Type	÷ Z	one C	Circle	Division	Sub Division							
Bridge List		Fleet		1	Borguna Subidkhali Bridge Demo	Box Culvert	D	haka I	Dhaka	Dhaka	Dhaka-1							
		Pina		2	bottoli bridge	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka						
V Bridge Inspection	Perio	odic Inspect		3	Ddemo matamuhuri	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhake						
Bridge Evaluation				4	Demo Amtoli	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka			Evnort Prepar	e losoe	ection Sheet	1
Bridge Remedial Measure		_		5	demo atia	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka						1
Differe Demontation	Filte	er <del>v</del>		6	demo bandua	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka						
List Bridge Hemedy List			8	7	Demo Choudhury	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka						
		cords per page		8	demo Kaharol	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka						
	SI	Inspection Result		9	Demo Karnafuli	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	on	Sub Division	SAE		Мар	
	1			10	Demo Kkroy	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 2	9	
	2			11	Demo Lalu	PC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhake	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 1		
	3			12	demo mirja	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1-2	9	
	4		8	13	demo nandail	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 2		
	5			14	Demo pat bridge	PC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 2		
	6	8		15	Demo Rahman	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 1	9	
	7	8		16	Demo Randhunibari	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 1		
	8	8		17	demo Rashidpur	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 2		
	9			18	Demo shammi	RC Girder Bridge	D	haka I	Dhaka	Dhaka	Dhaka-1	SO-Dhaka	haka	Dhaka-1	SO-Dhaka Sub-division	1 - 1		

- (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.

#### <u>!! Only for 1st Periodic Inspection in 2018 !!</u>

Because this is  $1^{st}$  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
- $\succ$  Last periodic inspection result sheet
- (a) Click "Prepare Inspection Sheet".
- (b) Choose "Periodic Inspection" and "Targeted Bridge" in Select a bridge for inspection.
- (c) Click "New Sheet".
- (d) Click "Create".

#### Note

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

#### Preparation to input Inspection Result into BMS

- (a) Complete and check the paper documents.
- (b) Take PDF Scan Data of Field sketch of defects.
- (c) Make Defects Photos sheet with Form of Excel.You can download the form from link at login page of BMS
- (d) Make PDF file of completed Defects Photos sheet.

#### Input Inspection Result into BMS

BRIDGE MANAGEM	ENT S	YSTE	M (BMS	)											💿 м	Ir. Inspe	ctor ~
	BRIDG	E INSPE	ECTION LIS	σT													
	O Back	( 1 🙆 D	ashboard /	Bridge Ins	pection												
	Bric	iges	Bridge Ins	pections	Bridge Ev	aluations Bridge Rei	nedial Measure Bridge Remedies										
Dashboard																	
🔳 Bridge List		Fina		Submitted	For Review	Draft	Blank Sheets										
Bridge Inspection	Per	iodic Ir	nspection	Integr	ated List	L	All new inspection sheets ar	e store	d under t	he tab	"Blan	k Shet	s"				
A Bridge Evaluation															Evrort Prepare In	spectio	a Sheet
Bridge Remedial Measure																species	Gilbor
Bridge Remedy List	Fil	ter +															
	Re	cords per	page 50	]											Search:		
	SI	Action	Inspection Result	Report Form	Inspection Date	Bridge +	Bridge Type	Road No	Chainage	LRP Name	Zone	Circle D	livision	Sub	SAE	¢ M	ар
	1	⊕ <i>/</i> ∩	2	<b>B</b>	2018-04-16	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 2	0
	2	0 A		È	2018-04-16	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 2	9
	3	8 A		È	2018-03-05	Mohsthan Bridge	RC Girder Bridge	N5	237.000	237	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 1	•
	4	ê A			2018-03-05	demo-atik	RC Girder Bridge	N5	36.679	BC036	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 1	8
	5	@ /A	2	Ľ	2018-03-05	Demo12345 @ Meghna	RC Girder Bridge		37.700	40a	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 1	•
	6	@ //			2018-03-05	Demo Karnafuli	RC Girder Bridge		0		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 1	8
	7	0 /A	2		2018-03-05	Demo Kkroy	RC Girder Bridge	N5	5800.000	6	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 1	•
	8	8 A	8	Ľ	2018-03-01	demo Rashidpur	RC Girder Bridge		112.250	112a	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 2	•
	9	@ //i			2018-03-01	demo_kader	RC Girder Bridge	N2	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-Dhaka Sub-division	1 - 1	0

- (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.

								0% in:	spect	ion ha	s be	en co	mplet	ed														
1 2 »									10	0%	inp	ut re	quir	ed to	pro	cee	d to i	next	ster	)								
File Number	INS-Z50	6420	01804	16				Brid	ge Nar	me	Test	Maki (	0413	Culver	t Su	Superstructure		e Bo	Box Culvert		Year		2	050				
Zone	Dhaka				Circ	e D	haka	Divis	sion		Dhak	a			Su	ıb-div	ision	D	naka-1		SAE		S	O-Dh	aka S	ub-div	rision	1 - 2
Inspection Date	2018-0	4-16	m		Insp						specto	or	Ac	Admin														
Survey Result	No. of C	ross B	leam	Line	0									Sp	Span Length 3.000				No. o	f Spa	ns 1	/2						
		Stee	el 👘	_			Conc	rete					Other	s	_			Com	mon	_	_	_					_	
Elements Input result in white bo only	Defect:		Corrosion	Crack in Steel	Lcose or Missing Bolts	Fracture	Deterioration of Paint System	Crack	Spalling /Exposed Rebar	Water leakage/ Efflorescence	Fallen out of Deck Slab	Cracking of Deck Slab	Delamination	Abnormal Spacing	Difference in Level	Abnormal Bituminous Pavement	Functional Disorder of Bearings	Other Types of Defects	Defects of Reinforced Materials	Abnormal Anchorage	Discoloration/Deterioration	Water Leakage/Puddle	Abnormal Noise/Vibration	Abnormal Deflection	Deformation/Break	Accumulation of Debris	Settlement/TitvMovement	Scouring
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Head Slab		01						$\square$		_																		
Footing	ŀ	01							-	_					_													
		01						$\square$	-	_					_													
		~1						$\square$											$\square$									

- (g) Blanked Inspection sheet is displayed.
- (b) Input "Rating of Defects" and fill all cells in the sheet. You can input following characters.

Ratin	Rating of Defects												
$\succ$	" _ "	: Element doesn't exis	st in	n this bridge.									
$\succ$	" N "	: non visible.											
< cas	e 1 >		< 0	case2 >									
$\succ$	" a "	: no defect	۶	" a "	: not existing								
$\succ$	" b "	: small defect	۶	" e "	: existing								
$\succ$	" c "	: medium defect											
≻	" d "	: large defect											

#### <u>Note</u>

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.

#### <u>Note</u>

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

#### <u>Note</u>

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"  $\triangleright$ :.Input "Element No., Kind of Defect".  $\triangleright$ "Description" : Note explanation of the situation. "uploading Image file"  $\geq$ 

File type 3 JPG or PNG



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

#### <u>Note</u>

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.

ill with "a"			
4			
File Number	INS-N10520180726		
Zone	Barishal	Circle	Pat
Inspection Date	2018-07-28		
Survev Result	No. of Cross Beam Line	5	

- (k) Click icon of Attached Documents and upload Field sketch of defects (PDF) and Defects Photos sheet (PDF).
- (D) Click icon of Work History and input information as followings,
  - > Date : choose inspection date
  - > Type : choose Periodic Inspection.
  - Element and Content : input "none".
  - > Bridge Rated and Remarks : keep blank.

Summary Recommendation		
a 1 2 p	t for review Back	
Inspection Pictures	Picture is not available	<b>5</b>
Attached Documents		A
	Attached Documents is not available	
Inspection Comments		
	Comment is not available	
Work History		II
	Work History is not available	
		0

(m) You can click "Submit for Review".

Click "*Submit for Review*", then the inputted inspection result sheet is submitted to Sr. Inspector with email (automatically sending system).
### **Recheck and Modification of Inspection Result**

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

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

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

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector Fvaluator	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).

#### <u>Note</u>

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.

## <u>Note</u>

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.

Sys. Admin	D-Entry	D-Check	Committee
Inspector	Sr.Inspector	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 (b).
  - >> If the Category is "C" or "D", you have to review inspection result of the bridge..
- (f) Review the result by referring Bridge Inventory, Field sketch of defects (PDF) and Defects Photos sheet (PDF).
- (g) Click "Recheck" if you find something strange result. Then email to inform it is sent to Inspector automatically. At the same time, "Need Recheck (x)" in Bridge Inspection shows (x : number of submitted bridges to recheck).
- (h) Click "Sign & Approval" if you don't find any points to be modified.

## 6.6 Input and Browsing of Evaluation Result : Bridge Evaluation

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

Following flowchart shows outline of "input" and "approval" step of Inspection result in BMS. You can refer "3.7 Bridge Inspector" to understand types of Inspector in the chart. This section shows explanation of "Periodic Inspection".



Figure. Flowchart of inputting Evaluation Result into BMS

## 6.6.1. Preparation to input Evaluation Result

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

It is better to print out following items.

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

	-										-			-	-
6.2. Outlin	e of	"Br	idge	e Eva	aluation" p	age						Sys. Admin	D-Entry	D-Check	Cor
												Inspector	Sr.Inspect Evaluato	r Chief Insp.	P
BRIDGE MANAGEN	IENT S	STEM	(BMS)											Admin 🗸	
*	BRIDGI	E EVALUAT	TION coard / Br	dge Evaluation											
Dashboard Bridge List	Brid	9 Final	ridge Inspec	mmittee (Unsig	ned) Unsigned	Committee	Recheck	Tempo	arry Final	Dr	aft	2 Blank Sheets			
Bridge Inspection Bridge Evaluation Bridge Remedial Measure	Eval	uation In er <del>-</del>	tegrated	List							(	11 Expx	ort 📄 Add T	emporary Evaluation	
Settings	12 Rec	cords per pag	0 50									13	Search:		
Tools	SI	Evaluation Result	Inspection Result	Evaluation Date	Bridge Name 0	Bridge Type	+ Roat	Chainage	LRP Name	Zone 🝦	Circle 🖕	Division 🖕	Sub Division	SAE	
Activity Log		8	Ľ	2018-01-01	Final Trial RC Girder Bridge	RC Girder Bridge	Z102	9 5.500	005c	Mymensingh	Jamalpur	Sherpur	Sherpur -1	SO-Sherpur Sub	
	4		È	2018-01-02	Golora Bridge-3	RC Girder Bridge	N5	45.800	045c	Dhaka	Dhaka	Manikganj	Nayarhat		
	3	8		2018-08-04	Gazikhali Bridge	RC Girder Bridge	N5	42.300	042a	Dhaka	Dhaka	Manikganj	Nayarhat		
	4			2018-08-04	Gazikhali Bridge	RC Girder Bridge	N5	42.300	042a	Dhaka	Dhaka	Manikganj	Nayarhat		
	5		L.	2018-07-30	Test_Kanchan	RC Girder Bridge	N2	0.000	LRP 64	Dhaka	Narayangong	Narayanganj	Narayanganj-2	SO-Narayanganj Su	
	6	8		2018-07-30	test sornomoti	RC Girder Bridge	N50	5800.000	23+600	Rangpur	Rangpur	Lalmonirhat	Lalmonirhat	SO-Lalmoni	
	7	2	Ľ	2018-07-30	Test Kanchan	RC Girder Bridge	N10	0.000		Dhaka	Narayangong	Narayanganj	Narayanganj-2	SO-Narayanganj Su	
	8			2018-07-30	test iw	RC Girder Bridge	N2	64.250	LRP 064	Dhaka	Narayangong	Narsingdi	Shibpur	SO-Shibp	
	9			2018-07-30	test additonal ojt	RC Girder Bridge	N2	64.250	LRP064	Dhaka	Narayangong	Narsingdi	Shibpur	SO-Shibp	

- 1. Click "Add Temporary Evaluation" to create new evaluation sheet.
- 2. Click "Blank Sheets" to view all blank evaluation sheets.
- 3. Click "Draft" to view all draft evaluation sheets.

- 4. Click "Temporary Final" to view all temporary final evaluation results.
- 5. Click "Recheck" to view all evaluation sheets sent for recheck.
- 6. Click "Committee" to view all evaluation results submitted to committee.
- 7. Click "Unsigned (Evaluator)" to view all evaluation results approved but unsigned by evaluator.
- 8. Click "Unsigned (Committee)" to view all evaluation results approved but unsigned by committee.
- 9. Click "Final" to view all final evaluation results approved and signed.
- 10. Click "Filter" to filter evaluation list.
- 11. Click "Export" button to download evaluation list in excel format.
- 12. User can change number of rows to show in list table. Example: 10, 25, 50, 100.
- 13. User can search bridge by any values of bridge data.
- 14. Evaluation list view actions:
  - o "Recycle Bin Icon": Click this icon to delete evaluation sheet.
  - "Book Icon": Click this icon to view evaluation results. 0
  - "File Icon": Click this icon to see bridge inventory data. 0

RIDG	GE EVALUA	Sel	ect an	inspection s	sheet for eval	uation						^				
Baci	k I 🙆 Dash	board	ecords pe	r page 50					2	Search:	test					
Bric	dges B	kridge	SI Ins	pection Results	Bridge Nan	ne ÷	Bridge Type	Zone	Circle	Division	Sub-Division	SAE				
		3	1	8	Test Chanda	ina	RC Girder Bridge	R710	20.000							
			2		Test 0728 Makishin	na Bridge	Steel Girder Bridge	N402	99.500	999z	Mymensingh	Mymensir		Blank Sheets		
Fil	lter -		_			_		_	5	Can		lew Sheet		Capit		
		ge 50														
SI	Evaluation Result	Inspection Result	Evaluat	tion	Bridge Name		Bridge Type		Road	Chainage	LRP Name	Zone 🖕	Circle 🖕	Division	Sub Division	S
1			2018-0	1-01 Final Tria	I RC Girder Bridge		RC Girder Bridge		Z1029	5.500	005c	Mymensingh	Jamalpur	Sherpur	Sherpur -1	SO-Sherpur S
2		B	2018-0	1-02 Go	lora Bridge-3		RC Girder Bridge		N5	45.800	045c	Dhaka	Dhaka	Manikoani	Navarhat	

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

## 6.6.3. Step-by-step instruction for Bridge Evaluator

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

RIDG	E EVAL	UATION														
Back	( ) <u>6</u> 80 C	Dashboard /	Bridge Evalu	uation												
Bric	iges	Bridge Ins	spections	Bridge Evalu	ations Bridge Re	medial Measure	Bridge Remedies	Bridge	Data S	Settings						
													_			
	Fina	al 🛛	Committee (	Unsigned)	Unsigned	Committe	e Recheck		Temp	porary Fina	al	Draft	Bla	nk Sheets		
Eva	luatior	n Integrat	ed List													
														Export	Add Tempora	ry Evaluation
													_			
Fil	ter -															
Re	cords per	r page 50	1											Sea	rch:	
		Evaluation	Increation	Evaluation	Bridge		Bridge		load		100			_	Sub	
SI	Action	Result	Result	Date	Name	¢	Туре	0	No (	Chainage	Name	Zone 🖕	Circle 🖕	Division 🖕	Division	SAE
1	畲		L.	2018-08-06	Gazikhali Bridg	0	RC Girder Bridge		N5	42.300	042a	Dhaka	Dhaka	Manikganj	Nayarhat	
2	窗		L.	2018-08-01	Test Balu		RC Girder Bridge	١	N501	20.000	007	Mymensingh	Jamalpur	Tangail	Tangail	SO-Tan
3	Û			2018-07-30	Test Kazirhat		RC Girder Bridge			0						

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

#### <u>Note</u>

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.

														🦳 Mr. Senior Inspector 🗸
	EVALUATION EDIT S	HEET												
	🗘 Back   者 Dashb	oard	/ Evaluation /	Update										
													🚔 I. Print t	his sheet 📕 I Print all sheets
A Dachhaard						100% evaluation	on has been	comp	leted				- Contrained	
							100%				lf voi	think it's	necessary t	o carry out
Bridge List	x 1 x		If	you th	ink the	defect ma	iy do pa	asse	enger		Detai	led Inves	stigation to ge	et more information
Bridge Inspection			ch	eck in	"Public	: Safetv" ł	jury,				and r	eason of	the defect,	
A Bridge Evaluation	4	_			- T Gone	, ourcey is		>			chec	k in "Deta	ailed Investig	ation" box.
Pridae Remedy List	File Number		EVA-R23- LRP02	3-2017030	3	Bridge Name		t	est_feb_2	3 Supe	rstructure	Box Culvert	Year	2003
Les bruge Kenica's Lise	Zone		Dhaka	00		Circle		1	Dhaka	Divis	on	Dhaka	Sub-division	Sub Division-1, Dhaka
	Evaluation Date		2017-07-11	517-07-11						Evalu	8601	Admin		
	Inspection Result			Material		NO. OF CROSS BEA	im Line	et et	- 1	NO. C	r Hinge 🔺	1	No. of Span	1/1
	Component El	Elem	ent Type		Type of Defe	ects	No Repair	Mino	r Repai r	Major Repai	r Emerg ency	Public Safety	Detailed investigation	Remarks
					1. Corrosion					0	0	0	8	
					2. Crack			8						
	Choose a	a ca	ategory.	Charl	3. Loose or	Missing Bolts		8			8		0	
				Steel	4. Fracture			2						
					5. Deteriorat	tion of Paint	_	_		_	_	_		
					System			S						L
					6. Cracking									
					7. Spalling /	Exposed Rebar								
				Concrete	Efflorescenc	e								
					9. Fallen out	t of Deck Slab								
					10. Crack of	Deck Slab								
					12. Abnorm	ation al Spacing								
					13. Differen	ce in Level								

(D) 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.

Evalu	ation Category
≻	"At " : No Repair
$\succ$	" B <sub>t</sub> " : Minor Repair
$\succ$	" Ct " : Major Repair
۶	" D <sub>t</sub> " : Emergency
$\succ$	" N " : Not Visible

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

## <u>Note</u>

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"*.

## <u>Note</u>

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,
- $\succ$  Click "Save as Final" if "Ct" or "Dt" in primary element doesn't exist.
- $\succ$  Click "Submit to Committee" if "Ct" or "Dt" in primary element exists.

## 6.6.4. Step-by-step instruction for Appraisal Comittee

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

#### <u>Note</u>

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

- (a) Click "Bridge Evaluation".
- (b) Click "Committee".
- (c) Choose "Targeted Bridge".
- (d) Check and discuss with the EVALUATION APPROVAL SHEET.
- (e) Click "Recheck", "Approval But Sign Later" or "Sign & Approval".

## 6.7 Arrangement of Rough Cost Estimate : Bridge Remedial Measure

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

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



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

#### 6.7.1. Preparation to input remedy information

It is better to print out following items.

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

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

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

ړ	·	= E	BRIDGE	E REMEDIAL	. MEASURE												
Ş		4	O Back	🌆 Dashb	oard / Bridg	e Remedial Mea	sure										
4			Bride	ges Brid	lge Inspection	s Bridge E	valuations Bri	dge Remedial Measure	Bridge Remedies Bridge Da	ta Settings							
🚯 Da																	
🔳 Br				Final	2	raft 🚺											
			Rem	nedial Mea	asure List											•	
🔥 Bri																Expo	rt
🖪 Br			Filt	er •	-									-			
					- 4									6			
🔳 Br		7	Rec	ords per page	10									Se	arch:		
💼 Se			SI	Final Count	Result Sheet	Report Form	Evaluation Date	Bridge Name	Bridge Type	Road No	Chainage	LRP Name	Zone 🗄	Circle 🔅	Division 👌	Sub Division	
			1	8		E .	2018-07-26	AdditionI OJT Bridge	RC Girder Bridge	Z1029	5.500	005c	Mymensingh	Jamalpur	Sherpur	Sherpur -1	SO-5
			2		Ð	E)	2018-07-25	Test_101	Steel Girder Bridge with Concrete De	ck N105	0.000		Barishal	Patuakhali	Barguna	Barguna	
			3			E.	2018-05-07	Ddemo matamuhuri	RC Girder Bridge	N5	70.250	70a	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-I
			4			L.	2018-04-16	Amtola Bailey Bridge	Potable Steel Bridge	R315	0.000	044a	Dhaka	Dhaka	Manikganj	Nayarhat	
			5			L.	2018-04-16	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-I
			6	0			2018-04-13	Test Maki 0413 Culvert	Box Culvert	Z5064	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-I
			7				2018-04-13	Test Maki 0413 Bridge	RC Girder Bridge		0		Cumilla	Cumilla	Brahmanbaria	Brahmanbaria	
			8			E .	2018-04-11	Dummy Maki Bridge	RC Girder Bridge	N5	0.000		Dhaka	Dhaka	Dhaka	Dhaka-1	SO-I
			9	8			2018-03-08	Ddemo matamuhuri	RC Girder Bridge	N5	70.250	70a	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-I
			10	0		È	2018-03-08	demo_dtc_D	RC Girder Bridge	N5	182.362	179b	Dhaka	Dhaka	Dhaka	Dhaka-1	SO-I
			4														+
			Sho	owing 1 to 10	) of 60 entries								Prev	vious 1	2 3 4	5 6 N	lext

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

#### 6.7.3. Step-by-step instruction for Bridge Evaluator

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

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

## < Remedial Measure Edit Sheet >

RÐ	MEDIAL MEASURE ED	DIT SHEET												
0	Back   🙆 Dasht	board / Remedial M	leasure / Upda	ate										
												ALP	rint this sheet	heets
	1 2 *													
1	4									,				
	File Number	REM-Z10	29-005c-20180	728 Brid	ige Name A	dditionI 0.	JT Bridge		S	iuperstructure	Concrete Bridge	Year 2019		
	Zone	Mymensi	ingh	Circ	le Ja	amalpur	Divis	67 S	herp 5	iub-division	Sherpus	SAE SO-Sherpur S	ub Division 1-1	
	Rei 1 ure	2 –	_ 3 _	4	5	lo of coso	6		<u>    8   </u>	valuar 9	Adm 10	<b>[1]</b>	12	_
ŀ	Component	Element Type	Material	Type of Defects	Remedy measu	ure	Unit Cost	Unit	Quantity	No. of Element	Subtotal Cost	Additional Cost	Total Cost	$\neg$
ŀ				1. Corrosion										-
				2. Crack in Steel										
			Steel	3. Loose or Missing Bolts										
			00000	4. Fracture										
				5. Deterioration of Paint System										
				6. Crack	Crack Injectuon	1	5419	m	108.00	3	1755756	Additional Cost	1755756	
				7. Spalling /Exposed Rebar	Fluid Recasting Mo	ortar 9	95793	m3	18.00	3	5172822	Additional Cost	5172822	1
			Concrete	8. Water leakage/ Efflorescence	None			-	0.00	0	0	0	0	
				9. Fallen out of Deck Slab										
	-			10. Cracking of Deck Slab										
				11. Delamination	None			-	0.00	0	0	0	0	
				12. Abnormal Spacing	None			-	0.00	0	0	0	0	
				13. Difference in Level										
		Main Girder	Others	14. Abnormal Bituminous Pavement										
				15. Functional Disorder of										

- 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.



Inspection Result	ı	Crack	
Main Girder	01	с	$\leftarrow$ 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".



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

8 Browsing	Result of	f BN	ЛS	: Bı	ridge	Remed	lv Li	ist			Sys. Admin	n D-Entr	y D-Ch	eck Cor
210112119	1005410 0.			2.			. <u>,</u>				Inspector	Sr.Inspec Evaluat	tor Chief	Insp. P
BRIDGE MANAGEN	IENT SYSTEM	(BMS)											Admir	1 ×
	BRIDGE REMEDY	LIST												
	G Back   🙆 Dasht	ooard / E	Bridge Rer	medy										
	Bridges B	ridge Insp	ections	Bridge	e Evaluation	s Bridge Remed	al Measure	Bridg	ge Remedies	Bridge D	ata Settings			
🚳 Dashboard	1		2		(	3	4		5					
🗮 Bridge List	All		A Cate	egory	в	Category	C Category		D Categor	y				
	Bridge Reme	dy Inte	grated	List										
H Bridge Evaluation	0 0												Export	
🚯 Bridge Remedial Measure	Filter -	iew All												
Bridge Remedy List	9						_				10			_
💼 Settings 💦 🖒	Records per pag	e 10					11				Se	arch: sa		
🖋 Tools	ge ⊮e	Bridge Length	Bridge Width	Road No C	hainage	Sub-Division	Damage Category	Damage Degree	Importance Degree	Priority to Remedy	Subtotal Cost (BDT)	Additional Cost (BDT)	Total Cost (BDT)	Mε
	with Concrete Deck	30.00	5.3	N1	19.53	Sub-Division-1, Dhaka	D	100	80	92	25085423.74	713.00	25086136.74	8
	with Concrete Deck	20.00	5.40	R05	95.00 S	ub-Division-1, Barishal	D	100	55	82	2054236.00	0.00	2054236.00	4
	Showing 1 to 2	of 2 entrie	20									Previou	s 1 Ne	xt

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

## 6.9 Data Analysis with Exported Data

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

- (a) Click "Bridge Remedy List".
- (b) Confirm "Latest" is enabled.
- (c) Arrange Integrated List with Filter, Records per page and Search.
- (d) Click "Export" to get exported Excel sheet.

Back	Dashboard / Bridge Ro	emedy
Bridges	Bridge Inspections	Bridge Evaluations
Late	ast All	A Category
100000		

(d) Open the Excel sheet and follow manual in next page.

	Information	BMS Result of Manikganj Area (.	1st Periodic	Inspection,								10.	. Input Bu	idget Am	ount.	Budget (BDT)
	Date	2018 Jan 16				] 1. Inp	ut Inform	atio	n and dat	ف					2	6,000,000
Γ			:			•				ון						:
No.	Bridge Name	Bridge Type	Bridge Length	Bridge Width	Road No	Chain -age	Sub -Division	 0	Damage I Dategory I	Jegree	mportance Degree	Priority to Remedy	Subtotal	Additional Cost	Total Cost	Cumulative RepairCost
1	Gazikhali Bridge	RC Girder Bridge	113.3	8.1	N5	42.300	Nayarhat	-	D	97	95		3,001,951	0	2,112	2,112
2	Golora Bridge-3	RC Girder Bridge	48.7	8.0	N5	45.800	Nayarhat	Ĺ			loccondi		5,026	0	3,001,951	3,004,063
3	Kolta Bailey Bridge	Bailey Bridge with Steel Deck	52.0	3.9	Z5064	11.412	Manikganj	T			ובארבווחו		0	0	126,026	3,130,089
4	Kholapara Bridge	RC Girder Bridge	25.4	10.3	R504	18.200	Manikganj		or ascend	ing orde	2		0	0	0	3,130,089
5	Wrishibari Bridge	RC Girder Bridge	13.2	7.9	N5	42.925	Nayarhat	7	with this s	witch o	f each co	Jumn.	3,323	0	0	3,130,089
9	Keliya-1 Bridge	RC Girder Bridge	150.6	7.0	N5	29.010	Nayarhat		-				0	0	1,453,323	4,583,412
7	N54014680			04002		choot		-	В	37	100	62	0	0	0	4,583,412
8	Bymile Bridge			sypure	n excel	אוובבר.		_	В	56	70	61	0	0	0	4,583,412
6	Bathuli Bridge-3	3. Click "D7" cell.						_	В	34	100	60	197,184	0	0	4,583,412
10	Kashimnagar Culvert	A Bight click and Das	ta it ac	oule/"	"\/\/				В	52	70	59	65,236	0	197,184	4,780,596
11	Bathoimuri Bailey Bridge-1			v aluc				-	В	55	65	59	0	0	65,236	4,845,832
12	Bathuli Bridge-1	RC Girder Bridge	13.4	8.0	N5	38.800	Nayarhat		в	33	95	58	14,180	0	0	4,845,832
13	Sorupai Bailey Bridge	Bailev Bridge with Steel Deck	36.7	3.4	Z5064	7.812	Manikeani	$\vdash$	c	64	45	56	0	0	14,180	4,860,012
14	Kunduriya Bridge	E Salact all calls of c	- umilo-	"D" fror	"D7" "	houttod	L		в	49	65	55	13,437	0	0	4,860,012
15	Kalampur Bridge-2			5	-		<u> </u>	$\vdash$	в	23	100	54	1,570,460	225,000	238,437	5,098,449
16	Kalampur Box Culvert	🕇 6. Click "Data".					<u>I</u>		A	19	100	52	782.889	150,000	1.720 460	6,818,909
17	Dautiva Bridoe-2	T Click "Data Toole"					1	╞	Ā	18	100	51	) (	ð	Q.	7 601 798
18	Sharifhao Bailey Bridoe						1	+	: "	38	201	51	° C		0	7 601 798
10	Sutianted Dailog	8. Click "Text to Colu	"sumr				1	+	~	17						0 751 700
19		a click "Finich"						+	V ·	1/		umulativ	e repair (	COST IS OV	e L	8,351,798
70	Chakrabarti Bridge-2						_1	+	V ·	=	in that	in "Badge	st Amoun	ť.	ο	8,351,798
21	Keliya Bridge-2	-						+	A .	4		o a lloo			0	8,924,946
22	Baroipara Box Culvert 3	Concration 5, to 9, is	necess	Irv for	"O" and	"8"		+	A	~ '		ב רבוו מוב	colol ed.		0	8,924,946
23	Choto Tora			2	5	-		+	V	2	100	44	D	0	0	8,924,946
24	Chandra Box	DOX CUIVEIL	0.C	0.77	04CNI	000.01	inayarnat	-	A	5	100	43	0	0	0	8,924,946
25	Sreerampur Bridge-1	RC Girder Bridge	48.7	8.5	N5	35.920	Nayarhat	-	A	5	100	43	0	800,000	500,000	9,424,946
26	▲ - 2 - 4					Book1	· Microsoft Excel		A	0	105	42	0	0	0	9,424,946
27	File Home Inse	tt Page Lavout Formulas D	Jata Revie	w View	Develope	T Add-Ins			A	0	100	40	19,372	0	0	9,424,946
28									Α	10	85	40	0	0	19,372	9,444,318
29			onnections	A A Z	×	Clear E	+ +		A	0	100	$\overline{\langle}$	578.217	0	0	9.444.318
30	From From From	m Other Eviting	roperties	Z. I Sort	Eilter	seapply E	vt to Demoire		A	0	100	40	0	50.000	628.217	10,072,535
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32	Get Externi	al Data Connec	tions	~1	sort & Filter	J	]		Operati	on 5. to	9. has d	one	0		0	10,072,535
33	A1 ,	- ( <i>e</i>								"0" "						10 072 535
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38								-			done	yet for cc	olumn "Q	and R".		10,072,535
39					-										7	10,072,535
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Information	BMS Kesult of Manukganj Area (	Ist Periodic	Inspection)										
Date	2018 Jan 16												
		Road	Chain	qnS	Damage	Remove	New Br	idge	Cost of F	tebuild of Brid	lge (BDT)	Comparing (	ost Every Year
Bridge Name	Bridge Lype	No	-age	-Division	Category	or not	Bridge Length	Bridge Type	Remove	Rebuild	Total	Kemedy cost (20 vears)	Kebuild cost (50 vears)
Gazikhali Bridge	RC Girder Bridge	N5	42.300	Nayarhat	D	Remove	113.3	Concrete	67,980,000	67,980,000	135,960,00	106	2,719,200
Golora Bridge-3	RC Girder Bridge	N5	45.800	Nayarhat	С	Remove	48.7	Concrete	29,220,000	29,220,000	58 00	150,098	1,168,800
Kolta Bailey Bridge	Bailey Bridge with Steel Deck	Z5064	11.412	Manikganj	D	Remove	52.0	Concrete	31,200,000	31,200,000	000'00	6,302	1,248,000
Kholapara Bridge	RC Girder Bridge	R504	18.200	Manikganj	D	Remove	25.4	Concrete	000 010 21	1031	000000	)	609,600
Wrishibari Bridge	RC Girder Bridge	N5	42.925	Nayarhat	В	Remove	13.2	Conci 20	years lat	er, it may	be 0	0	317,520
Keliya-1 Bridge	RC Girder Bridge	N5	29.010	Nayarhat	В	Remove	150.6	Conci ne	rescarv t	o remedu	again <sup>0</sup>	72,667	3,614,400
N54014680	Box Culvert	N540	14.680	Nayarhat	В	Remove	9.6	Conc			0 1000	)	230,400
Bymile Bridge	RC Girder Bridge	R504	18.836	Manikganj	В	Remove	25.6	Concrete	15,330,000	15,330,000	30,660,000	)	613,200
Bathuli Bridge-3	RC Slab Bridge	SN5	39.200	Nayarhat	в	Remove	7.8	Concrete	4,680,000	4,680,000	9,360,000	)	187,200
Kashinnagar Culvert	Box Culvert	R504	16.860	Manikganj	В	Remove	13.5	Concrete	8,100,000	8,100,000	16,200,000	9,86(	324,000
Bathoimuri Bailey Bridge-1			0+ "+0		В	Remove	30.5	Concrete	18,288,000	18,288,000	36,576,000	3,262	731,520
Bathuli Bridge-1		- 5 9		caluciate	$\bigwedge$	Remove	13.4	Concrete	8,040,000	8,040,000	16,080,000	)	321,600
Sorupai Bailey Bridge	Cost of rebuilding	the brid	ge.		ل	Remove	36.7	Concrete	22,020,000	22,020,000	44,040,000	502	880,800
Kunduriya Bridge	If vou don't have a	nv idea	MOU		В	Remove	33.0	Concrete	19,800,000	19,800,000	39,600,000	)	792,000
Kalampur Bridge-2			<b>`</b>		В	Remove	13.2	Concrete	7,890,000	7,890,000	15,780,000	11,922	315,600
Kalampur Box Culvert	cnoose "Kemove".	aeralui			Α	Remove	91.4	Concrete	54,810,000	54,810,000	109,620,000	023 023	2,192,400
Dautiya Bridge-2	RC Girder Bridge	N5	32.850	Nayarhat	А	Remove	13.0	Concrete	7,800,000	7,800,000	15,600.000	39,145	312,000
Sharifbag Bailey Bridge	Bailey Bridge with Steel Deck	R315	49.800	Nayarhat	В	Remove	115.0	Concrete	69,000,000	000'000'69	A		2,760,000
Sutipara Bridge	RC Girder Bridge	N5	35.180	Nayarhat	Α	Remove		can Co	mnare w	ith cost to	Remedy	37,500	1,178,400
Chakrabarti Bridge-2	PC Girder Bridge	N540	0.000	Nayarhat	Α	Remove						)	828,000
Keliya Bridge-2	RC Girder Bridge	N5	29.520	Nayarhat	A	Remove	and	Kecon	struction			28,658	292,560
Baroipara Box Culvert 3	Box Culvert	N540	13.900	Nayarhat	A	Remove	The	cell of	more exp	bensive m	ethod	U	48,000
Choto Tora	RC Girder Bridge	N5	56.788	Manikganj	Α	Remove		porolo	-			)	456,000
Chandra Box	Box Culvert	N540	15.600	Nayarhat	Α	Remove				:		)	120,000
Sreerampur Bridge-1	RC Girder Bridge	5N	35.920	Nayarhat	Α	Remove	Eac	ch cost i	s calcula	ted as foll	owing,	25,000	1,168,800
Jubijongol Bridge	eel Girder Bridge with Concrete De	5N	24.550	Nayarhat	Α	Remove	^	Remedy	/ cost / 2	0 lifespan	vear (defa	) (1L	292,560
Kusthia Bridge	RC Girder Bridge	SN5	0.000	Manikganj	Υ	Remove							456,000
Sreerampur Bridge-2	RC Girder Bridge	5N	0.000	Nayarhat	Α	Remove	^	Kepullt	nc / 1son	Illespan /	/ear (derau	596 (n	456,000
Corerdanga Box Culvert	Box Culvert	5N	76.922	Manikganj	Α	Remove	You	u can ar	range ea	ch lifespa	n year.	)	88,800
Kalampur Bridge-1	RC Girder Bridge	N5	34.080	Nayarhat	Α	Remove	1.01	CULCICIC	000,000,1	000,000,1	000,000,01	31,411	313,200
Bongshi Bridge	PC Girder Bridge	N5	25.230	Nayarhat	Α	Remove	197.0	Concrete	118,212,000	118,212,000	236,424,000	)	4,728,480
Noyadingi Bridge	RC Girder Bridge	N5	43.700	Nayarhat	Α	Remove	26.0	Concrete	15,600,000	15,600,000	31,200,000	0	624,000
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	C	0
0	0	0	0.000	0	0	Remove	0.0	Concre	0	0	0	0	0
0	0	0	0.000	0	0	Remove							0
0	0	0	0.000	0	0	Remove	0 12	Choo	se Mater	ial of new	bridge	0	0
0	0	0	0.000	0	0	Remove	-	Concre	te" or "S	reel" to ca	Iculate Cos	+	0
0	0	0	0.000	0	0	Remove	0	5		buideo	)	,	0
0	0	0	0.000	0	0	Remove	0	In reput	ang une	nridge.		0	0
0	0	0	0.000	0	0	Remove	0	f you do	on't have	any idea	now,	0	0
0	0	0	0.000	0	0	Remove	0	hoose '	Concret	ulefalu	+)	0	0
0	0	0	0.000	0	0	Remove	0				-1	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0
0	0	0	0.000	0	0	Remove	0.0	Concrete	0	0	0	0	0

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

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

## 7.1 Outline of BMS in Routine inspection

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

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

## 7.2 Input and Browsing of Inspection Result : Bridge Inspection

### 7.2.1. Preparation to input Inspection Result.

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

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

### 7.2.2. Outline of "Bridge Inspection" page

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

You can find "Routine Inspection Integrated List" at bottom of Bridge

	Final	Draft	Blank	Sheets											
Rout	ine Inspectio	on Integra	ted List											1	
	•												Prepare	Inspectio	in Sh
	5											-			
Filte															
Filte	ir 👻	6										7			
Filte	ords per page 10	6										7 Search:			
Rect SI	r  rds per page 10 Inspection Result	6 Report Form	Inspection Date	0	Bridge Name	Bridge Type	Road No	Chainage	¢ LI Na	P Zo	ne (Cir	7 Search:	Sub Division	SAE	м
Filte Reco SI 1	Inspection Result	Report Form	Inspection Date 2018-06-26	¢	Bridge Name wara Culvert-2	Bridge Type Box Culvert	Road No N5	Chainage 74.218	¢ LI Na 7	P Zo ne Dh	ne <b>Cir</b> ska Dha	Clea Division	Sub Division j Manikganj	SAE	м
Filte Reco SI 1 2	Inspection Result	Report Form	Inspection Date 2018-06-26 2018-06-25	¢ Arp Amto	Bridge Name vara Culvert-2 la Bailey Bridg	Bridge Type Box Culvert Potable Steel Bridge	Road No N5 R315	Chainage 74.218 0.000	<ul> <li>LU Na</li> <li>7</li> <li>04</li> </ul>	P Zc a Dh	ne∳ Cir aka Dhi aka Dhi	Search: Cle Division Ika Manikgan Ika Manikgan	Sub Division j Manikganj j Nayarhat	SAE	M

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

### 7.2.3. Step-by-step instruction

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

## Preparation for Field Inspection

	Final	Draft	Blank	k Sheet	s										
Rout	tine Inspectio	on Integra	ted List												
															_
													Prepare	Inspectio	on S
Filte	er •														
Filte	er •														
Filte	er • ords per page 10	•										Search:			
Filte Reco SI	er - ords per page 10 Inspection Result	Report Form	Inspection Date	¢	Bridge Name 🔶	Bridge Type	Road	Chainage	LRP Name	Zone 🍦	Circle	Search:	Sub Division	SAE	
Filte Reco SI	er - ords per page 10 Inspection Result	Report Form	Inspection Date 2018-06-26	φ	Bridge Name	Bridge Type Box Culvert	Road No	Chainage 74.218	LRP Name 74a	Zone () Dhaka	Circle	Search: Division) Manikganj	Sub Division Manikganj	SAE	
Filte Reco SI 1	er - Inspection Result	Report Form	Inspection Date 2018-06-26 2018-06-25	¢	Bridge Name Arpara Culvert-2 Amtola Balley Bridge	Bridge Type Box Culvert Potable Steel Bridge	Road No N5 R315	Chainage 74.218 0.000	LRP Name 74a 044a	Zone () Dhaka Dhaka	Circle Dhaka Dhaka	Search: Division Manikganj Manikganj	Sub Division Manikganj Nayarhat	SAE	

- (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".
- (b) 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.

File Number		INS-Z1029-0050	-20180728		Inspector	Admin	Date	2018-0	07-28	
Zone		Mymensingh	Circle	Jamalpur	Division	Sherpur	Sub-Di	vision	Sherpur -1	
								Lat	89° 59' 59"	
Road No.		Z1029	Road Name	unknown			GPS	Long	12º 59' 59"	
Bridge Name		AdditionI OJT Bri	idge LRP+Offset (m)		500		Chainage (m)		5.500	
							Span N	lo.	2	
(*)	Inspection Elen tefer to bottom	nents of form)	Problem (Yes/No)	Rectified (Yes/No)	Maintenance Required (Yes/No)	Inspection Required (Yes/No)	Loca	ation and	d Comments	
Deck Surface										
Deck Surfa	ce									
Difference	in Level									
Abnormal	bituminous pave	ement								
Accumula	ion of debris									
2 Expansion	Joints						-			
Material d	efects*									
Abnormal	spacing									
• Accumula	ion of debris									
Abnormal	anchorage									
Abnormal	deflection									
Deformati	on /break									
Drainage s	vstem					-	+			
Material D	efects*									
• Water lea	age									
Deformation	on /break									
Accumula	tion of debris									
Material *		Defects descrip	tion		1		_			
Concrete		Crack, spalling/e	exposed rebar, wat	erleakage/efflorescen	se, delamination					
Steel		Corrosion, crack	in steel, loose or i	missing bolt, fracture,	deterioration of pai	nt system				

- (D) 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".

### <u>Note</u>

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

# 8. HOW TO USE BMS IN OTHER INSPECTION

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

## 8.1 Interim Inspection

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

> Purpose

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

> Scope

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

> Example:

Bridges posted for a weight limit less than the legal weight limit. The sign of rapid deterioration of a particular bridge element. Bridges with potential foundation problems such as scour.

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

- (a) Click "Bridge Inspection".
- (b) Click "Prepare Inspection Sheet" and create periodic inspection sheet of targeted bridge.
- (c) Open the blank inspection sheet, and click icon of "Attached Document".
- (d) Upload the report PDF.
- (e) Input "This is result of Interim Inspection on (Date)" at "Summary" bottom of the sheet.
- (f) Click icon of "Work History" and input information.
- (g) Click "Fill with a". After that click "Submit for Review". If the bridge is multiple span bridge, click "Save and Next" and fill with "a" all sheet.
- (h) Senior inspector and Chief inspector give approval. Evaluation is not necessary.

## 8.2 Emergency Inspection

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

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

> Purpose

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

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

> Scope

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

To judge the severity of the defect, design documents, as built drawings and

a history of maintenance works carried out earlier should be reviewed.

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

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

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

## 8.3 Detailed Investigation

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

> Purpose

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

> Scope

The following objectives are covered by detailed investigation.

To grasp detailed behavior and actions of defect

To monitor the progress of any defect

To investigate the cause of defect

To test and evaluate material quality or strength

To evaluate structural strength

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

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

# 9. TECHNICAL NOTE

## 9.1 How to calculate Damage Degree

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

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

Damage Degree of the bridge is calculated by following rule,

1) Bridge Type with Bearings



2) Bridge Type without Bearings



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



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

"Weight of Component" x

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



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 " =  $\Sigma$  ("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" =  $\Sigma$  ("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 " =  $\Sigma$  ("Total 3" of each component)

				_							1)	0.50 x	1.00 X (	0.60 X	
Ca	omponen Max pt	t Impact	Element 1	Types weight	Span No.	Defect	weight	E	valua degre	ted e	Damage degree	Total 1	Total 2	Total 3	
					1	Corrosion	0.60	С	→	67	21 <sup>1</sup>	25	Sp1>S <b>25&gt;10</b>		
			Main girder	1.00	1	Missing bolt	0.20	B	→	33	4	25	2 <b>5</b> 2 <sup>8</sup>		
					2	Corrosion	0.60	B	<b>→</b>	33	10	10		25+3 +12 =40	
Super-	50	0.50	Cuese beem	0.25	1	Corrosion	0.60	B	→	33	3	3	2	40 <sup>4</sup>	
structure	- 50	0.50	Cross beam	0.23	2	none	0.00	A	→	0	0	0	3	40	
					1	Cracks	0.75	B	→	33	10	10+2=			
		Deck slab		Deck slab	0.80	1	Efflorescence	0.13	B	→	33	2	12 12	12	
					2	Cracks	0.75	В	<b>→</b>	33	10	10			
					1	Cracks	0.43	В	→	33	3	3			
			Abutmenet	0.67	2	Cracks	0.43	С	<b>→</b>	67	6	0	8		
					2	Efflorescence	0.29	В	<b>→</b>	33	2	8		8+8 +21 =37	
Sub- structure	30	0.30	Diam	0.67	1	Cracks	0.43	С	→	67	6	0	0	30	
			rier	0.07	1	Efflorescence	0.29	В	<b>→</b>	33	2	0	0		
			Foundation	1.00	1	Scouring	1.00	С	→	67	21	21	21		
	Fou	roundation	1.00	2	none	0.00	A	→	0	0	0	21			
					1	none	0.00	A	$\rightarrow$	0	0	0			
Bearings	20	0.20	Bearing	1.00	2	Function Disorder	0.75	В	→	33	5	5	5	5	
											Bridge	Damage 1	Degree	75 8	

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 Coe of Elem	fficient	Weight Coe of Defe	fficient	Conv Evaluat	verted ed Score	Damage Point	
	(A)		(B)		(	C)	$(A)_{x}(B)_{x}(C)$	
	Main Girder	1.00	Cracking	0.33	Bt	33	10.89	
		1.00	Spalling	0.67	Bt	33	22.11	
щ		1.00	Water leak	0.17	Bt	33	5.61	
NR.		1.00	Delamination	0.17	Bt	33	5.61	
лот		1.00	Discolor	0.03	Bt	33	0.99	
FRL	Cross Beam	0.25	Cracking	0.40	Bt	33	3.30	1
RS <sup>-</sup>		0.25	Spalling	0.60	Bt	33	4.95	
РЕ		0.25	Delamination	0.20	Ct	67	3.35	
su		0.25	Discolor	0.05	Bt	33	0.41	
	Deck Slab	0.80	Fallen out	1.00	Bt	33	26.40	1
		0.80	Crack of DS	0.25	Bt	33	6.60	
		0.80	Delamination	0.03	Bt	33	0.79	
	Sub Dam	age point	of Superstrue	cture			91.01	(D)
	Total Dar	nage poin <sup>.</sup>	t of Superstructure		X <sub>dd</sub> = 0.50		46	X <sub>dd</sub> x (D)
	Maximam point = X <sub>dd</sub> x 100 = 50 > 46 ok							

	Weight Coe of Elem	fficient ent	Weight Coe of Defe	fficient cts	Conv Evaluat	verted ed Score	Damage Point	
	(A)		(B)		(	C)	(A)x(B)x(C)	
	Abutment 0.67		Cracking	0.43	Ct	67	19.30	
JRE		0.67	Spalling	0.57	Bt	33	12.60	
СТІ		0.67	Water leak	0.29	Bt	33	6.41	
RU		0.67	Delamination	0.14	Bt	33	3.10	
ST		0.67	Discolor	0.14	Bt	33	3.10	
UB		0.67	Water leak	0.14	Bt	33	3.10	
S	Foundation	1.00	Cracking	0.40	Bt	33	13.20	
		1.00	Spalling	33	9.90			
	Sub Dai	mage poin	t of Substruct	ture			70.70	(D)
	Total Da	image poi	nt of Substruc	ture	Y <sub>dd</sub> = 0.30		21	Y <sub>dd</sub> x (D)
Maximam point = $Y_{dd} \times 100 = 30 > 21$ ok								

	Weight Coe of Elem	efficient nent	Weight Coe of Defe	fficient	Conv Evaluat	verted ed Score	Damage Point	
	(A)		(B)		(	C)	(A)x(B)x(C)	
	Bearing	1.00	Corrosion	0.25	Bt	33	8.25	
		1.00	Crack	1.00	Bt	33	33.00	
		1.00	Missing bolt	0.50	Bt	33	16.50	
0 N		1.00 Fracture 1.00 B 1.00 Paint system 0.25 B		1.00 Bt		33	33.00	
٨RI				Bt	33	8.25		
BE/		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 po		oint of Bearin	g	4		177.55	(D)
	Total Damage point of Bearing Z <sub>dd</sub> = 0.20				0.20	36	Z <sub>dd</sub> x (D)	
	Maximam point = $7 \times 100 = 20 \le 36$					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 tume	with hearings)
Table 0.0	Impact level	or component	(Dridge 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
uperstructure	0.6	This damage directly impacts bridge function
		The second





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

#### ----- 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.Abnornal 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.Abnornal 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.Abnornal 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

#### ----- 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

#### ····· Bearings ·····

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	<ul> <li>Concrete]</li> </ul>
------------------	-------------------------------

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

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

## 9.2 How to calculate Importance Degree

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

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

#### Class of Road :

e.g.

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

#### > Traffic Volume

e.g.

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

#### > Detour/Alternate Route

e.g.

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



#### Crossing under the Bridge

e.g.

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

Score of current BMS is shown in next page.

## [ Class of Road ]

Maximum score is "30".

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

## [Traffic Volume]

Maximum score is "25".

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

## [Detour/Alternate Route]

Maximum score is "15".

Name	Score
Detour doesn't exist	15
Detour exists	0

## [Crossing under the Bridge]

Maximum score is "30".

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

## Note

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

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

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

## 9.3 How to calculate Priority to Remedy

Priority Remedy is calculated by following formula.



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

## 9.4 How to choose Remedial Measure

Remedial measure is chosen by combination of "Evaluation Category" and "Type of Defects". Targeted remedy measure is shown as following table.

e.g. Main	Girder	(Steel	or	Concrete)
-----------	--------	--------	----	-----------

Type of	Evaluation	Category		
Defects	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	-		
1		1		

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

#### Note

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

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

## 9.5 How to Calculate Quantity to Remedied

Quantity of each member to be remedied are necessary to calculate cost of Remedial Cost. For example, "Repainting of Steel Member" is required "Area (m<sup>2</sup>) 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.
#### <u>Note</u>

"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)
- $\succ$
- $\rightarrow 1.5 \text{m x } 2 \text{ side} = 3.0 \text{m}$

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

 $\rightarrow$ 

**2.0 x**  $\leftarrow$  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  $2 \rightarrow 1.0 x$ 

 $\leftarrow$  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**  $\leftarrow$  coefficient

MG Width x Span Length

: Basic Formula 204

For Concrete Deck Slab

 $0.05 x \qquad \leftarrow \text{ coefficient}$ 

Interval of MG x Span Length

: Basic Formula 202





#### e.g.7 Crack Injection of Concrete Deck Slab

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

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



\*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



- 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**  $\leftarrow$  coefficient

*Fix (Fix is same as 1.0)* Basic Formula 101

#### e.g.11 Repaint or Replacement of Bearings



#### 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

