Government of the People's Republic of Bangladesh
Local Government Engineering Department

BRIDGE SAFETY AUDIT MANUAL

December, 2025

Message

It is a matter of great satisfaction that the Bridge Safety Audit Manual has been developed under the Program for Supporting Rural Bridges (SupRB), jointly funded by the Government of Bangladesh (GoB) and the World Bank. This Manual marks a significant milestone in LGED's efforts to strengthen safety management of rural bridge infrastructure, ensuring that investments remain secure, reliable, and resilient.

The Manual provides clear directions for engineers and auditors to systematically assess bridge safety conditions, identify potential risks, and recommend appropriate corrective measures. It emphasizes practical approaches for conducting inspections and audits, thereby enhancing the durability, serviceability, and safety of rural bridges and culverts.

I am confident that this Manual will greatly benefit LGED officials at Upazila, District, and program levels in planning and executing bridge safety audits. It will also strengthen institutional knowledge and capacity, enabling LGED to safeguard rural connectivity and protect infrastructure investments against safety-related challenges.

LGED reaffirms its commitment to ensuring that bridge asset management remains efficient, accountable, and safety-focused, thereby contributing to sustainable and resilient infrastructure development.

(Kazi Golam Mustafa)
Chief Engineer
Local Government Engineering Department

Message

It is a great pleasure to present the Bridge Safety Audit Manual, developed under the SupRB project. This Manual represents a significant advancement in LGED's bridge asset management practices, providing systematic guidance for safety audit planning and operations.

The Manual emphasizes the fundamentals of bridge and culvert safety audits, offering step-by-step directions for identifying hazards, evaluating structural conditions, and selecting appropriate remedial actions. It has been designed to complement the RuBIMS database, software, and Mobile App, making bridge safety management more efficient, technology-driven, and accountable.

This Manual will serve as a practical tool for contractors, engineers, and LGED officials at all levels, helping them to adopt standardized safety audit practices, minimize risks, and ensure the durability, serviceability, and safety of bridge structures. It will also contribute to the future development and strengthening of LGED's Bridge Safety Policy.

I extend my sincere appreciation to the World Bank Task Team and subject matter experts for their valuable comments and feedback during the preparation of this Manual. Together, we reaffirm our commitment to building infrastructure that is not only strong and resilient but also safe, responsible, and sustainable.

(Md. Belal Hossain)
Additional Chief Engineer &
Project Director
Program for Supporting Rural Bridges (SupRB)

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CHAPTER 1. GENERAL

1.1 What is Bridge Safety Audit?

Bridge Safety Audit (BSA) is a systematic and formal safety performance examination of a bridge conducted by an independent and qualified team to examine existing or future bridges. The primary objective of a bridge safety audit is to identify any potential safety hazard issues and provide expert recommendations to effectively mitigate these. The audit team comprises experienced engineers, planners, and other transportation professionals who possess in-depth knowledge and expertise in the field of bridge safety.

1.2 A brief history of Bridge Safety Audit

Safety audit for road including bridge began in the late 1980s when a Road Safety Engineering (RSE) team in a County in England began to question the number of newly built roads including bridges that were appearing in the County's black spot list. With support from the County Surveyor, a policy was developed requiring all new road including bridge designs in the County to be checked and approved for Safety by the RSE team prior to construction. This checking process became formalized as Road Safety Audit (RSA) and the RSE team became the first road safety audit team. It can be said that RSAteam applied their black spot investigation skills in a proactive way so as to eliminate safety concerns at the design stage. For the bridge project the term "bridge safety audit" came to be used then, and continues to be used today, to refer to a thorough and detailed examination of a bridge design from a bridge safety perspective.

In many developed countries, the practice of using specialists to carry out safety audits of road including bridge schemes during the design and construction stages has undoubtedly led to safer roads and bridges being produced. The adoption of Safety Audit Practice is one of the key activities identified by the National Road Safety Council in Bangladesh and the introduction of the practice is specified in the National Strategic Road Safety Action Plan, launched in the year 1997. Recently, it is realized to adopt Bridge Safety Audit for the bridge project like Road Safety Audit of road project by Program for Supporting Rural Bridges (SupRB) of LGED.

1.3 Bridge Safety Audit: LGED Perspective

Local Government Engineering Department (LGED) is primarily in charge of planning, developing, executing, and maintaining rural road along with bridge infrastructure in Bangladesh. Reasonably, LGED is responsible for improving rural bridge safety. Although necessary initiatives have been taken, further efforts are needed to enhance rural bridge safety. According to studies, performing bridge safety audits and implementing bridge safety engineering measures, changing the behavior of all bridge users including drivers, and institutionalized bridge safety programs may considerably enhance bridge safety conditions.

1.4 Scope and Objectives of this Manual

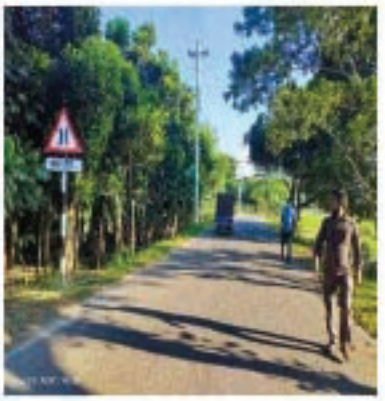
Bridge safety audits will ensure the safety provisions for the following categories:

(i) Minor Maintenance
(ii) Major Maintenance
(iii) Rehabilitation
(iv) Capacity Expansion

(v) Replacement
(vi) New Construction

The main objective of bridge safety audit is to ensure that all new bridge schemes operate as safely as practicable. This means that safety should be considered throughout the entire cycle of design, construction and pre-opening of any project facility and also during operation & maintenance of the bridge. Specific objectives of BSA are to:

- minimise the risk of accidents occurring on the scheme, and to minimise their severity.
- recognise the importance of safety in bridge design to meet the needs and perceptions of all types of bridge user.
- reduce the long term costs of a scheme, bearing in mind that unsafe designs may be expensive or even impossible to correct at a later stage.
- improve the awareness of safe design practices by all involved in the planning, design, construction and maintenance of bridges.


CHAPTER 2. WHAT IS THE NECESSITY OF BRIDGE SAFETY AUDIT?

2.1 Why Bridge Safety Audit is needed?

Bridge safety audits are essential to ensuring that bridges are safe for all users. Bridge safety audits can identify potential safety hazard issues before these become accidents, reducing the risk of injuries and fatalities. Bridge safety audits can also help to improve the efficiency and operation of bridges and approaches, reducing congestion and improving traffic flow.

Bridge safety audits can also help to keep communities safe and reduce the burden on emergency services. By identifying potential safety issues and addressing these before accidents occur, bridge safety audits can help to reduce the number of emergency services callouts and hospitalizations.

Bridge safety audits offer several benefits, including:

- Improved safety: Bridge safety audits identify potential safety issues and provide recommendations to mitigate these, reducing the risk of accidents and injuries.
- Cost-effective: Addressing potential safety issues before these become accidents can be more cost-effective than dealing with the consequences of an accident.
- Improved efficiency: Addressing safety issues can improve the efficiency and operation of bridges and approaches, reducing congestion and improving traffic flow.
- Reduced liability: By addressing potential safety issues, bridge safety audits can help to reduce liability risks for bridge authorities and other stakeholders.

2.2 Stakeholders involved in Bridge Safety Audit Process

Bridge Safety Audit is based on the principle of an independent review. Bridge safety audit process reveals that three parties will be involved in this process - Client, Designer and Auditor. For the Public Private Partnership projects (PPP) the client would be both the Govt., and the Concessionaire with their respective obligations as provided in the Concession Agreement. One fundamental idea is that disagreements between the designer and the auditor are resolved not by the designer but by the client. So it is an interaction between different parties, whose roles are predefined at specific stages. In Bangladesh, for large and small projects client may be Local Government Engineering Department (LGED), Roads and Highways Department (RHD), Bangladesh Bridge Authourity (BBA). Designer may be one department of client or one private consultant and Auditor may be another consultant. Sometimes design may be done by the design section of concerned client. Here the client and the designer are different. In such cases, some appointed consultants could carry out the task of auditing. Main functions of the key stages in bridge safety audit are shown in Table 2.1

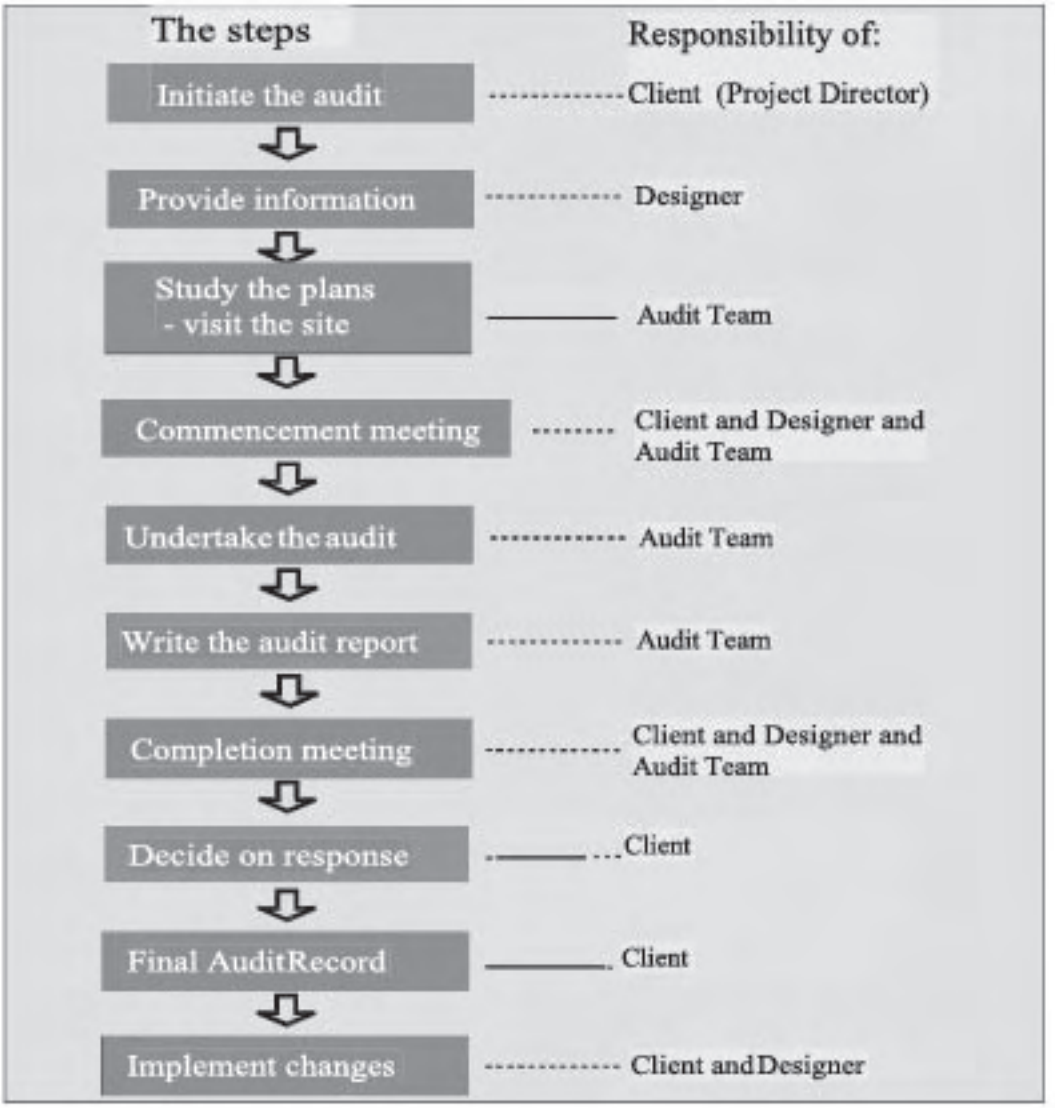
Table 2.1 Main Functions of the Key Players in Bridge Safety Audit

Key Player	Main Functions
Project Owner (Govt. and/or Concessionaire)	• Expresses a commitment to bridge safety • Provides funding and resources • Considers safety audits and reviews as an essential quality control requirement. • Commissions audits and reviews at appropriate times • Selects bridge safety audit team • Facilitates the response to the recommendations of audits and reviews and arranges implementation of recommendations that are accepted • Attends commencement and completion meetings
Design Team	• Attends commencement and completion meetings. • Provides relevant information to safety audit team. • Acts upon and documents response to recommendations of audit.
Safety Audit Team	• Identifies safety hazard issues in the proposed design. • Makes constructive recommendations to enhance safety. • Documents safety hazard issues and recommendations. • Holds commencement and completion meetings with the client and design team.

2.3 The Audit Process

The steps in the audit process are illustrated in the flow chart in Figure 1. It is important to broadly follow this process in order to ensure that the audit is done in a systematic way. The process is the same whatever the type and scale of project being audited, but the amount of work involved in each step will vary.

Figure 1 Steps in the Audit Process



CHAPTER 3. LEADING ELEMENTS INVOLVED IN BRIDGE SAFETY AUDIT PROCEDURES

3.1 Type of Projects for Which Bridge Safety Audit Should be Performed

Bridge safety audits are applicable to all types of bridge projects and to all categories of bridges in rural areas. Bridge safety audits can be conducted on bridge projects as diverse as:

- New
- Replacement
- Capacity Expansion
- Rehabilitation
- Maintenance

3.2 Stages of Bridge Safety Audit

One bridge project can have up to five bridge safety audit stages. Audit stages 1 and 2 focus on the pre-construction phase - the feasibility/planning stage and the designs. It needs to be stressed that the earlier a bridge project is audited the better. At Stage 3 it checks the safety of the contractor's plans for the bridge works. At Stage 4 audit is done as a final check just before the bridge is opened to traffic. After the bridge has been open for a year. Stage 5 audit can be done to assess what, if any, safety problems have arisen. The stages are described hereunder:

3.2.1 Feasibility/Planning Stage

Audits at this stage can influence fundamental issues such as design standards, cross-section, route choice, impact on surrounding road network, and the number, location and vicinity of junctions. If a wrong or inappropriate decision is made, it will probably be impossible to correct the problem at a later stage in the design process.+

Feasibility/Planning stage sometimes recommend phased construction – for example, designing a bridge as a dual carriageway but with only one carriageway being built in the first stage. Auditors should be aware that this often involves design compromises that adversely affect safety. Interim designs need more attention, not less.

3.2.2 Design Stage

The preliminary and final design will determine the standards, the cross-section, and the alignment. The audit will check all these elements. Particular attention will be paid to any departures from standards, and the interaction between project elements that have been designed to minimum standards. The audit will also look at the wider issues, such as:

- Have the needs of all likely bridge users been considered?
- Is property access catered for safely?
- Are local traffic movements catered for safely?
- Are the connections to the existing road network adequate and safe?
- Check all the details including signs and markings, approach roadside obstacles, lighting, landscaping, pedestrian facilities, and connections to approach roads.
- Will the project staging, if any, affect safety?

It often happens that the auditors will identify problems that stand from decisions made during the feasibility/planning stage, such as the cross-section, the route and the vicinity of junction. If there was an audit at the feasibility/planning stage and these concerns were raised but rejected by the client, it will not be appropriate to raise them again. However, if there was no audit at the feasibility/planning stage, the auditors must include these concerns in the audit findings, even though it may be too late to change things.

3.2.3 Implementation Stage

Implementation tends to have an above-average number of crashes. Contractor must submit a detailed "Programme for the Passing of Traffic" that includes details of all signing, protection measures and arrangements for traffic control. Contractors are reminded to follow the provisions of the BRTA's "Guide to Traffic Signing". The Engineer supervising the construction on behalf of the LGED authority has to approve the Programme before the Contractor is allowed to proceed. There is also a requirement for the Contractor not to revise the Programme without the prior written permission of the Engineer. If all parties follow this procedure carefully the number of crashes can be minimised. In most cases the Engineer should be capable of making his own assessment of the Programme, but with big projects or complex situations (such as long bridges) it will be advisable to arrange a safety audit.

The focus of bridge works audits should be:

- advance warning
- guidance by means of signs and devices
- speed control
- clear and efficient traffic control
- protection of workers
- safe access for construction vehicles.

3.2.4 Pre-Opening Stage

This audit takes place immediately before the bridge is opened to traffic, and involves a detailed inspection of the bridge and all the signs, and other road furniture. The objective is to check for any hazardous feature that was not apparent at previous stages, that all the design details have been correctly implemented, and that the signing is quite clear. Check too that the roadway is free of construction equipment, building materials, etc., and that any temporary signage is ready to be removed when the bridge is opened to traffic. It is useful to have a local traffic police officer take part in the inspection, as they are likely to have a good understanding of how the local people will cope with the new bridge. They can also be asked to arrange for an increased police presence in the first few days after opening.

An 'immediate post-opening' audit can also be done after the bridge has been open for a few days. This will show how the bridge is actually being used, and, if there are any problems, they will probably be apparent already. It may be possible to make minor changes before the contractor demobilises.

3.2.5 Post-Opening and Existing Bridges Satge

Safety audits of existing bridges help identify unsafe, inconsistent, outworn, and outdated

elements in the bridge environment. There are an opportunity to review how the various design elements interact, how bridge users are actually using the bridge facility, and what problems, if any, they are experiencing. This makes Stage 5 audits especially useful when planning major maintenance or rehabilitation projects.

The audit team should inspect the bridge together, from the view point of all bridge users. It is not sufficient to just drive along the bridge - wherever pedestrians are found the team must get down from the vehicle and check what it is like to walk along the bridge and to cross it. The inspection should be done without first checking the crash data, so as not to bias the findings. The aim is to identify safety deficiencies of design, layout and road furniture. A two- stage inspection process is recommended for long bridge sections of about 30m or more. The first stage should focus on identifying the main problems of the route and where they are located. This is followed by the detailed stage during which a close examination of the selected problem areas is done.

Once the preliminary assessment has been completed the results should be checked against the crash history. Sometimes a site that looks unsafe may be found to have had no crashes. The auditor should be cautious about recommending corrective action, because of the risk of making things worse, but note that:

- crash history is not necessarily a good indicator of future crashes, especially on lightly- trafficked rural bridges
- police crash records are considerable and crash locations may require recheck
- pedestrians and cyclists may be making long detours to avoid the site because of its perceived danger
- if it is a known and obvious safety problem (e.g. an unprotected bridge parapet end on a high- speed road) it is probably worth treating it.

Stage 5 audits are not a substitute for blackspot studies. The most economical way of treating the safety engineering problems of the busier sections of the road network is probably by doing blackspot studies. Stage 5 audits are more appropriate for the less trafficked parts of the network where there is not much crash data.

3.3 Cost and Benefit Scenario of Bridge Safety Audit

The safety audit involves assessments to ensure the bridge is structurally sound, adheres to design specifications, and complies with safety standards. Safety Audits do not cost very much, and a typical audit is likely to take no more than a few weeks to complete. Many audit recommendations will cost little or no extra money, and may even save money. The evidence from countries that have adopted safety auditing suggests that the costs of changes introduced as a result of a safety audit are significantly outweighed by the safety benefits, namely less crashes, less severe crashes, and less damage to road furniture. Direct benefits to bridge authorities include avoidance of expensive reconstruction to remedy safety deficiencies, and lower liability claims. Lifecycle costs may also drop, because safer designs often carry lower maintenance costs.

The total cost of all safety audits (feasibility/planning, design, implementation, pre-opening and post opening) usually falls between 1% and 5% of the total construction cost.

CHAPTER 4. Performing a Bridge Safety Audit: Step wise execution

4.1 Step – 1: Site selection for Bridge Safety Audit

Bridge Safety Audit programs may encompass sites of any size being undertaken at any point in the bridge lifecycle. Client must make their own decisions about what sites to audit and when to audit based upon local issues and priorities. Selection criteria, too, may be simple in focus initially but may be modified in response to emerging needs and issues. These issues and priorities may vary over time, even year to year, and programs should be regularly reviewed and adjusted in response.

4.2 Step – 2: Selecting the Members and Composition of audit team

A Bridge Safety Audit Team should include at least two individuals who are not members of the Design Team. Ideally and to ensure full independence of the BSAs, auditors should not be employed by or be a contractual relationship with the design consultant. For many smaller and less complex projects, the Audit Team consists of a senior person experienced in conducting professional-level BSAs who serves as the Audit Team Leader and a second person who serves as an Audit Team member. Individuals with hands-on experience are the best qualified for a strong audit team. The advantage of having two or more people on an audit team is that they can detect safety issues that one person may overlook. In addition, an expert auditor can imagine a designor a circumstance and link it to bridge users' behaviors. For large projects, audit teams may need to be larger and to include individuals with varied experience in different sub-disciplines.

To perform Bridge Safety Audit for any LGED bridge project Audit Team can be formed as follows.

a. At head quarter:

   i) Superintending Engineer (Maintenance)
   ii) Executive Engineer (Maintenance)
   iii) Sr. Assistant Engineer (Maintenance)
   iv) Assistant Engineer (Maintenance)
   v) Consultant

b. At region:

   i) Superintending Engineer
   ii) Executive Engineer
   iii) Assistant Engineer

4.3 Step – 3 Preparing a Bridge Safety Audit Brief

Usually, the decision to audit brief is prepared by the client (Bridge Administration or Bridge Authority). However, it may be regulated by Ministry decision or by law.

Once a project has been identified, the project employer should establish defined parameters

for the BSA. The parameters should define the following:

a. the scope.

b. Time table for completion.

c. team necessities.

d. auditing duties.

e. formal audit reports' structure.

f. expectations for response of reports.

4.4 Step – 4: Examining Necessary Documents, Drawings and Checklists etc.

The audit team must be given all necessary information. The project designer should gather all essential and relevant information and provide it to the audit team in a readable way. Scheme reports, statistics, drawings, checklists and relevant portions of contract will be included in the information. This phase may need to be started long before the bridge safety audit team is called in. Additional information, such as traffic volumes may be required. This should be examined as soon aspossible to minimize delays. The audit team must also have a clear grasp of the tasks to be covered in the audit.

The information provided to the audit team should ideally contain the following, as a minimum:

a. background of the scheme and its intended function

b. scheme drawings

c. details of any part of the scheme which do not follow national standards

d. specific scheme details which may affect bridge safety

e. rehabilitation, widening, or larger maintenance scheme of existing bridge

f. available accident data

g. traffic flow and composition

h. any previous audit or BSI reports

i. any local issues that might affect road safety and need to be considered

j. local bridge safety officer, if appropriate, and police contact details

k. any other relevant information

4.5 Step – 5: Inspection of the spot/site to be audited

For a clear understanding of the project, a site inspection is essential for the auditors to see the bridge features, bridge environment, proposed design and scheme will interact with surrounding and nearby roads and bridges. Site inspections should be undertaken under the range of traffic and environmental conditions likely to be encountered. Both nighttime and daytime inspections are essential to appreciate the situation. It may also be necessary to view the location at other times of the day (e.g., after school finishes or during peak/off-peak period).

4.6 Step – 6: Preparation/Formulation of the Report on the Bridge Safety Audit Performed

The report should contain the features of the project, deficiencies which involve hazards and make recommendations about corrective actions. The recommendations must reflect sound judgement of the audit team and should be backed with convincing reasons for appreciation by the decision makers. Further, these recommendations will indicate the directions rather than details of the solutions to improve safety. The responsibility for acceptance of the directions will rest with the client. On acceptance, the responsibility for detailing the solutions will rest with the designer.

The report should be a concise, brief document setting out a summary of the measures to be taken, the reasoning behind recommendation of such measures and the items identified that require remedial measures/treatment from the safety point of view. The recommendations should be numbered or identified in a way, which make them easy to refer to in the follow-up reports.

Any safety issue, which is considered to be of sufficient concern to warrant immediate attention should be identified in the recommendations with the words 'FOR IMMEDIATE ATTENTION' and any safety problem, considered to have great potential danger should be identified as 'IMPORTANT'. In line with the need to maintain good communication with the designer and the client, the audit team should share the draft Audit Report with them and endeavour to resolve any uncertainties or misunderstandings by talking with the designer before drawing conclusions. However, the audit team must maintain a position of independence while finalizing the recommendations and the Audit Report.

Consistent with the scale of the project and subsequent scale of the audit, the report should be presented as under:

Project Information

- A report title which gives the name of the project and its extent, together with the stage of construction or development at which the audit is being undertaken.
- A very brief description of the proposal with an overall plan.

Background Information

- A list of the supportive material which was made available, such as reports and plans
- Names and particulars of the audit team
- Information about when the audit team members visited the site and conducted their assessment
- Records of Minutes of Meetings that the Audit Team had with the Client and the Designer(s).

Findings and Recommendations

For each aspect of the project which was identified as justifying attention for safety enhancement:

- A brief statement of what deficiency was found by the audit team. This could be in the form of statements cross-referenced to annotated plans.
- Provide photographs where considered appropriate.
- Recommendations proposed for corrective action.

Formal Statement

- A signed and dated statement by the audit team indicating that they have completed the audit together with a forwarding letter by the Auditor

4.7 Step – 7: Post-Audit Activities (Communication, Documenting and Debriefing etc.)

When audit report is received, it has to be acted upon so that safety is enhanced. A management and monitoring control system may be kept in place to keep the track of audits. The client would do well to respond the outcome of the safety audit. The objective is to deal with audit recommendations in an effective and objective manner; to decide whether and how the recommendations of the bridge safety audit should be implemented and, where it is decided otherwise, to record the reasons in writing for such a decision; to put agreed audit recommendations into effect.

4.8 Step – 8: Responding to the Recommendations of audit report

Once the client has taken decision on the Audit Report and finalized the list of recommendations that are accepted and agreed, they need to be implemented. The designer has to develop design changes, which address the safety problems. If audit has been carried out at the pre-opening stage, the actions need to be implemented as soon as possible on site. If a serious problem is identified, temporary warning, delineation or other treatment may be needed until the agreed solution is implemented.

4.9 Step – 9: Attending the Completion Meeting

The bridge safety auditor, the client, and the designer (for design phase of the project) or civil works contractor (for construction phase of the project) assigned for specific LGED bridge should be present at this meeting. It should not be considered as a chance to object to the findings or suggestions, rather misunderstandings may be cleared up at this discussion. However, it is best to do the clearings before the report is finalized. Besides, the meeting may be used by the client and designer (for design phase) or contractor (for construction phase) to solicit recommendations for resolving the highlighted issues. It must be ensured that the meeting is productive and cooperative, and conducted nicely. The discussion should begin with a reminder that the purpose of an audit is to improve the project's overall safety and is not a review of individual or design team performance. It is critical for all parties concerned to feel that the audit is necessary for the project development process. A significant effort should thus be made to ensure that everyone engaged has learned about the audit process and its benefits. Meeting facilitators must be cautious not to allow anger or baseless dispute and promote an environment conducive to healthy discourse. Prudence and intelligence are qualities that all participants must bring to the meeting.

CHAPTER 5. Checklists

5.1 General

Checklists are useful to assist the audit team. These checklists describe the performance and situations that can affect the bridge safety of selected types of project and audit stage. Checklists have been prepared for Stage 1 to Stage 5. These checklists will cover planning, alignment, cross-section, junctions, link road, traffic signs, road markings, road lighting, approach roadside hazards, approach road side furniture, vulnerable bridge users, cross- drainage structures etc. These checklists should be used as a guide to focus audit towards important matters that should be covered and not overlooked. Each project is different and will raise specific issues that may contain further safety implications. When reviewing each of the points, the team should consider that the bridge user would have to cope with conditions at night and in adverse weather conditions also.

The safety audit team should visit the site for identifying the deficiencies from safety angle of the stretch and should suggest remedial measures. The team should check planning, cross- sections, alignment, approach roadside furniture and facilities available, junctions, facilities for vulnerable bridge users, signs, marking and lighting and also approach road side hazards as suggested in the previous paragraph. Some sort of questionnaire should be prepared for each bridge. The questionnaire should include various aspects covered under the methodology of the safety audit.

5.2 Purpose of Checklists

Road Safety Audit checklists are presented in Annex A. These checklists have been designed as a prompt. They are not a substitute for knowledge of local conditions and experience: they are an aid for the application of that knowledge and experience. The checklists are to help an auditor not to overlook something important. It is stressed that a bridge safety audit is not an audit of the design standards, though these will need to be referred to, and their proper use makes a good starting point with any design. The written audit report should contain sufficient explanation of its recommendations, without any need to refer to notes on checklists. Designers can make use of the checklists to help them identify potential safety problems and cover the solutions in their designs.

5.3 When to use Checklists

The checklists are for use during an audit when

- Assessing the documentation; in particular, when the project drawings are being examined
- Inspecting the site. At this point, it is important to visualise how the project will fit into the existing features
- Writing the audit report - to re-check that the relevant issues have been addressed

These checklists can be used on existing bridges, new bridges, rehabilitation bridges and capacity expansion bridges etc.

5.4 How to use Checklists

Based on the stage of work, the required audit checklist should be used like the following.

a. Master Checklist can be used to scan any topics for audit and to prompt any questions about additional topics that can be considered.

b. While using the checklist in the field, auditors should mark on the checklist's feature, which they believe failed to meet the requirement, and required details can be noted in handbooks.

c. The audit checklists consist of commonly required elements of designs and practices. These are notexhaustive, and auditors should use their skills and judgments while demarking the safety of any element. While making judgments, it is required to be insightful, as the listed element of the checklist can be absent in the field, and that might have some negative impact on another element, and it is required to be addressed.

d. A general understanding of the project site before hand would help the auditors to make the best use of the checklist (Austroads, 2009; Morgan et al., 2019).

CHAPTER 6. Annexure: Checklists for carrying out for Bridge Safety Audit for different stages of the project

6.1 Bridge Safety Audit Checklists - Stage 1: Feasibility/Planning

Sl. No.	Category	Issues	Status (Yes/No/NA)	Remarks
1.1	Project function and scope	Is the scheme consistent with the development plans for the area?		
		Is the scheme consistent with the planned bridge hierarchy for the area?		
		Will the scheme adequately cater for: - cars?- motorcyclists?- pedal cyclists?- pedestrians?- heavy vehicles?- buses?		
1.2	Major generators of traffic	Does the scheme serve major generators of traffic safely?		
		Are there any developments, planned or committed, that may affect the new bridge?		
1.3	Network effects	Will the scheme alter the volume and speed of traffic on the approach roads and surrounding road network?		
		If so, will these effects result in safety problems?		
1.4	General design issues	Is the design appropriate for the bridge's function, category, traffic mix, etc?		
		Is the design speed appropriate?		
		Can any sudden change in the speed environment be safely accommodated?		
		Are there likely to be safety problems where the new/improved bridge connects with the existing road network?		
		Will the bridge permit the achievement of alignment standards (horizontal and vertical)?		
		Does the bridge fit in with the physical constraints of the landscape?		
		Will the bridge be affected by adverse weather - high winds, flood, tidal surcharge etc.?		
		Does the bridge passing areas where wild animals are available?		
1.5	Junctions and access control	Is the nearby junctions and their type appropriate for the bridge function, design speed, traffic volumes and turning movements?		
		Are there any properties with direct access?		

1.6	Alternative evaluation	Is the bridge safety performance one of the evaluation criteria?		

6.2 Bridge Safety Audit Checklists - Stage 2 – Design

Sl. No.	Category	Issues	Status (Yes/No/NA)	Remarks
2.1	General topics	Have the circumstances changed since the last audit (e.g. traffic volume, traffic mix, development plans, etc.)?		
		Has the general form of the project design remained unchanged?		
		Is the design satisfactory from a safety viewpoint (continuation of full carriageway and shoulder width, provision for pedestrians, cyclists, etc.)?		
		Does the parapet need to function as a safety barrier? If so, will it perform satisfactorily?		
2.2	General design	Is the design appropriate for the bridge's function, category, traffic mix, design year traffic volume, etc?		
		Is the design speed and speed limit for the bridge appropriate to the function of the road?`		
		Are the design details (e.g. carriage way widths, crossfall, superelevation, footway design, etc.) consistent?		
2.3	Cross-sections	Are the widths and lengths of the bridge in accordance with standards and adequate for the function of the bridge?		
		Does the cross-section help to reinforce the speed limit?		
		Are the needs of pedestrians, motorcyclists and bicyclists adequately catered for?		
		Is there a need to separate through traffic from approach roads?		
		Are there narrow sections is handled as safely as possible?		
		Are changes in cross-section (e.g. at terminal points) handled safely?		
		Will the carriageway drain adequately?		
2.4	Walkway and Railings	Is the walkway of appropriate width?		
		Is the condition of railing is good?		
		Is the painting is appropriately provided?		
		Is there any need for traffic stop location?		
2.5	Alignment	Does a vertical curve provide a smooth transition between different gradients on		

		approach road of a bridge ensuring safety, comfort and efficient vehicular movement?		
		Does the horizontal and vertical alignment give sufficient forward visibility for the selected design speed?		
		Are there any substandard (inconsistent) elements?		
		Does the horizontal and vertical alignment fit well together?		
		Does the alignment provide regular, safe overtaking opportunities?		
		Does the alignment avoid creating situations where the forward visibility is marginal for safe overtaking (dilemma zones)?		
		Does the alignment help to reinforce the speed limit?		
		Is there sufficient visibility on the approach to bridge?		
2.6	Junctions	Are junctions so close together that there may be a "see-through" problem?		
		Is the bridge near the junction as simple, clear and logical as possible?		
2.7	Pedestrians and other bridge users	Have pedestrian needs been satisfactorily considered?		
		Have the needs of cyclists and motorcyclists been considered?		
		Have the needs of bus users been considered?		
2.8	Major traffic generators/ access control	Does the bridge serve major generators of traffic safely?		
		Are accesses to major traffic generators located near to hazards (e.g. connections, sharp bends, sections with restricted visibility)?		
		Can accesses to existing properties be used safely?		
		Are there any landde properties with direct access?		
		Is there an alternative to direct access?		
2.9	Traffic signs	Is the level of signing appropriate for the bridge?		
		Do the signs (incl. road markings) conform to the Traffic Signs Regulations and the advice given in the Traffic Signs Manual?		
		Can the signs be seen and are they of sufficient size		
		Are signs located in appropriate and safe places?		
		Are the road markings correct?		
		Will reflective pavement markers (road studs)		

		be needed?		
		Should approach roadside marker posts (delineators) be provided in order to improve the "readability" of the approach road?		
2.10	Safety barrier	Are safety barriers provided on approach road where necessary?		
		Are they long enough to prevent an out-of-control vehicle from reaching the hazard? Are the terminal arrangements (upstream and downstream ends) safe?		
		Do safety barriers restrict visibility?		
		Do safety barriers block pedestrian desire lines?		
		Has steel beam w-guardrail been designed correctly (check beam height, post spacing, lateral clearance, spacer blocks, nuts and bolts, reflectors, terminal pieces, and whether the beams are overlapped correctly)?		
		Are there any features that could create a safety problem?		
2.11	Utilities	Is there adequate clearance for overhead power lines?		
		Can utility apparatus be accessed safely?		
		Are power boxes and access chambers located in a safe place (e.g. away from traffic lanes)		
2.12	Lighting	Is lighting required and, if so, has it been adequately provided?		
		If there are sites with night-time accident problems, are these covered by the lighting scheme?		
		Are the lighting columns located where they are less likely to be hit by out-of-control vehicles (as far as the need for even illumination allows)?		
		Is there adequate clearance between the lighting column and the edge of the carriageway?		
2.13	Railway crossing	Is the crossing located where visibility is adequate?		
		Is there a need for speed management measures on the approaches to the crossing?		
		Is there a need for barriers and signs? If so, have these been correctly designed?		

6.3 Bridge Safety Audit Checklists - Stage 3 – Implementation

Sl. No.	Category	Issues	Status (Yes/No/NA)	Remarks
3.1	Providing safety for everyone	Do the bridgeworks proposals cater safely for the passage of all types of traffic and roadusers?		
		Check that pedestrians and cyclists will be safe when crossing the site?		
		Can local people access their properties on foot and by vehicle?		
3.2	Signing	Does the signing provide sufficient advance warning of the bridgeworks?		
		Is all the signing in accordance with the provisions of the Traffic Signs Manual?		
3.3	Safe traffic movement through the site	Do the arrangements for the passage of traffic encourage smooth flow of traffic at safe speeds?		
		Will speed humps, speed limit signs, or other speed control measures be required?		
		Does the signing and channelisation provide clear guidance to drivers on which way they should go?		
		Are traffic lanes of sufficient width, taking account of vehicle mix, likelihood of wide vehicles, etc.?		
		Are the barricades, markers and other channelisation devices adequate (check size, robustness, colour, visibility, spacing, etc.)?		
3.4	Diversion roads	Are any diversion roads designed to safe standards (check width, alignment, drainage, edgemarkers, side slopes, junctions, signing, surfacing, etc.)?		
		Will there be a need for speed humps, speed limit signs, no overtaking signs, or other speed control measures?		
3.5	Work zone	Excavations, stockpiles of materials, etc., adequately fenced off and protected from moving traffic?		
		Has sufficient space been left for workers and plant to operate without coming into conflict with moving traffic?		
3.6	One-way working	Is one-way working acceptable, given the road's traffic function, traffic volume and speed?		
		Is the advance signing adequate (check visibility to queue tails)?		
		How will traffic be controlled? (traffic signals or STOP/GO boards are much safer than flagmen)		
		If one-way working will operate at night, what will be the traffic control arrangements?		

		– is there likely to be abuse by impatient drivers?		
		Will the STOP/GO signs or traffic signals be clearly visible to approaching traffic?		
		Is the shuttle lane excessively long?		
		Will the traffic control lead to unacceptably long delays to traffic?		
3.7	Access for workers traffic	Are the accesses for works vehicles safe (check location, signing, need for control, etc.)?		
3.8	Safety at night	Will the site operate safely at night?		
		Will the lighting be needed?		

6.4 Bridge Safety Audit Checklists - Stage 4 – Pre-Opening

Sl. No.	Category	Issues	Status (Yes/No/NA)	Remarks
4.1	General topics	Have any changes been made during construction that may lead to safety problems		
		Has the design been correctly translated into physical form?		
		Check that no bridge side hazards have been installed or overlooked.		
		Is safety adequate for: pedestrians of all ages, bicycles, truck and bus movements, motorcycles, cars?		
4.2	Drainage	Is the drainage of the bridge, approach road and its surroundings adequate?		
		Will the discharge from the drains cause problems (e.g. washaways of approach roads or bridges)?		
4.3	Environmental	Is planting located to avoid obstruction to visibility and sight lines?		
		Will planting cause problems when mature (i.e. size of trunk or canopy spread)?		
		Does planting obscure pedestrian movements near the end of the bridge and approach road?		
		Check that no natural feature creates a danger by its presence or loss of visibility.		
4.4	Approach roadside	Are there any obstructions or other hazards remaining in the clear zone?		
		Are there any "open windows" through which out-of-control vehicles could fall?		
		Have the appropriate types of kerbs (if any) been used?		

4.5	Safety barriers	Are safety barriers provided everywhere they are needed?		
		Are they long enough to prevent an out-of-control vehicle from reaching the hazard?		
		Are the terminal arrangements (upstream and downstream ends) safe?		
		Do safety barriers restrict visibility?		
		Do safety barriers block pedestrian desire lines?		
		Has steel beam w-guardrail been designed and installed correctly (check beam height, post spacing, lateral clearance, spacer blocks, nuts and bolts, reflectors, terminal pieces, and whether the beams have been overlapped correctly)?		
		Check that transitions between barrier types (e.g. steel beam guardrail to concrete bridge parapet) are safe.		
		Are there any features that could create a safety problem?		
4.6	Access to property and developments	Are all accesses safe for their intended use?		
		Are all accesses adequate, in terms of design, location and visibility?		
4.7	Services	Are access chambers, lines, boxes, lighting columns etc. located in a safe place? (i.e. clearof traffic lanes and behind any safety barrier).		
4.8	Alignment	Check that the bridge has no safety problems in each direction.		
		Are there any problems at night that are not apparent during the day?		
		Is there adequate visibility/stopping sight distance?		
		Check that the form of bridge and its traffic management are easily recognised under likely traffic conditions.		
		Check the need for more signs and markings.		
		Check that the edge delineation of the edge of the carriageway is clear.		
		Are drivers misled by any visual illusion?		
		Could the alignment of the old bridge mislead drivers?		
4.9	Junction(s)	Is the junction clearly visible to		

		approaching drivers?		
		Is the form and function of the junction clear to drivers on all approaches?		
		Are there any problems at night that are not apparent during the day?		
	Roundabout(s)	Check that the roundabout is fully visible and recognisable from all approaches.		
		Check that all signs and markings are correctly placed.		
4.10	Traffic signs	Are the correct signs used and are they correctly placed?		
		Check the visibility, legend and legibility in both daylight and in darkness.		
		Are there spelling or design errors?		
		Do they give the correct message to drivers?		
		Are they readable?		
		Are they located in a safe place?		
		Are clearance standards met?		
		Do the signs obstruct footways?		
		Are safety barriers needed to protect posts from vehicle impact?		
		Are any more signs required?		
		Are all the road markings placed correctly and fully visible?		
		Are reflective pavement markers correct and visible?		
		Check that all redundant signs (including markings) from the old alignment and temporary signs used during construction have been removed.		
4.11	Surface treatment	Does the surface appear to have adequate skid-resistance?		
		Are there any areas where there is excessive bleeding of bitumen?		
4.12	Pedestrian/Non Motorised Users	Is there safe crossing points?		
		Are there any obstructions that may affect safe passage of pedestrians?		
		Is there sufficient pedestrian guard railing?		
		Has guard railing been installed correctly?		
		Are there any places where cyclists may be particularly at risk?		

6.5 Bridge Safety Audit Checklists - Stage 5 - Post Opening and Existing Bridges

Sl. No.	Category	Issues	Status (Yes/No/NA)	Remarks
5.1	General topics	Review previous bridge safety audit (if carried out). Are there any issues still causing concern?		
		Do the Police have any concerns over accidents that may have occurred since opening (is there a predominant accident type that could indicate a particular problem)?		
		If a service road is present does the service road operate safely?		
		Is there any problem with headlight glare?		
		Has there been any change of use of existing developments on or near the bridge that has affected traffic safety?		
		Is the surface of the bridge and approach roads free from defects that may result in safety problems (i.e. loss of control or skidding)?		
5.2	Cross-section	Are the lanes, shoulders, medians etc., of adequate width?		
		Is there a pavement edge drop (i.e. shoulder is lower than carriageway)?		
5.3	Drainage	Is the drainage of the bridge, approach road and its surroundings adequate?		
		Have the side drains been designed to a safe standard for vehicles and pedestrians?		
5.4	Approach Road Side	Are the shoulders of an appropriate design (width, profile, surfacing, etc)?		
		Are the kerbs (if any) of the appropriate type for the speed environment?		
5.5	Safety barriers	Are safety barriers provided where necessary?		
		Are they long enough to prevent an out-of-control vehicle from reaching the hazard?		
		Are the terminal arrangements (upstream and downstream ends) safe?		
		Do safety barriers restrict visibility?		
		Do safety barriers block pedestrian desire lines?		

		Has steel beam w-guardrail been designed and installed correctly (check beam height, post spacing, lateral clearance, spacer blocks, nuts and bolts, reflectors, terminal pieces, and whether the beams have been overlapped correctly)?		
		Check that transitions between barrier types (e.g. steel beam guardrail to concrete bridge parapet) are safe.		
		Are there any features that could create a safety problem?		
5.6	Alignment	Is sight distance adequate for the speed of traffic using the bridge?		
		Are there sufficient warning signs?		
		Have speed limits been imposed?		
		Are they correctly signed?		
		Are there any sections of approach road that may cause concerns?		
		Have all old road markings been removed?		
		Are there sufficient clear overtaking sections?		
		Is the design of curves adequate (check super elevation, transitions, carriageway widening)?		
5.7	Speed management	Does the geometric design (cross-section, alignment, etc.) reinforce the speed limit?		
		Is there traffic exceeding the speed limit?		
		Is there a need for speed management measures?		
		Are speed humps and other speed control devices of a safe design and are they adequately signed?		
5.8	Junction(s)	Is the junction clearly visible to approaching drivers?		
		Is the form and function of the junction clear to drivers on all approaches?		
		Are there any problems at night that are not apparent during the day?		
	Roundabouts	Is the roundabout fully visible and recognisable from all approaches?		
		Are all signs and markings correctly placed?		
5.9	Pedestrian/Non Motorised Users	Is there an adequate network of footways and safe crossing points?		
		Are there any obstructions that may affect safe passage of pedestrians?		
		Is there sufficient pedestrian guard railing?		

		Has guard railing been installed correctly?		
		Does guard railing obstruct visibility?		
		Are there any places where cyclists may be particularly at risk?		
5.10	Bus and parking facilities	Are there sufficient approach roadside bus stop and parking facilities?		
		Are stopping areas located and designed to safe standards?		
		Are bus stops and parking facilities used in a safe manner?		
5.11	Access to properties	Is there any approach roadside activity that may cause road safety problems?		
		Is the number of approach roadside accesses compatible with the function of the approach road and the volume and speed of traffic?		
		Are all accesses adequate in terms of design, location and visibility?		
5.12	Traffic signs	Are all the necessary signs in place?		
		Are they readable? (consider in all conditions).		
		Are they located in a safe place?		
		Do they give the correct message?		
		Is there any confusion in the message they give?		
		Do posts need protection?		
		Is edge delineation adequate?		
		Are road markings correct and in good condition?		
		Are reflective pavement markers (road studs) correct and in good condition?		
5.13	Environmental	Does vegetation obstruct:		
		Traffic signs		
		Visibility at approach road and bridge		
		Stopping sight distances on the approach road		
		Footways/crossing points?		

CHAPTER 7. References

- Road Safety Audit Manual by Accident Research Institute, Bangladesh University of Engineering & Technology BUET).
- Manual on Road Safety Audit by Indian Road Congress
- Manual for Road Safety Audit in Bangladesh by , Ministry of Communications Roads and Railways Division, Government of the Peoples' Republic of Bangladesh
- A Guide to Road Safety Auditing by M/S Design Partnership, Tanzania
- Traffic signs manual of Bangladesh Road Transport Authority (BRTA)

CHAPTER 8 Appendix 1 - Outline Terms of Reference for a Bridge Safety Audit

Introduction

The objective of this assignment is to carry out a Stage [X] Bridge Safety Audit (BSA) of the proposed [insert name of project] so that potential bridge safety problems can be minimised. The conduct of the audit shall broadly follow the procedure set out in the latest edition of the Local Government Engineering Department, "Bridge Safety Audit Manual".

The following information will be made available for the audit:

[list reports, drawings, data, etc.]

Scope of Services

The scope of services include, but are not necessarily limited to, the following tasks:

1) Review the reports, drawings, etc., provided by the bridge authority
2) Hold a Commencement Meeting with the design team in order to obtain further information and understand the background to the design.
3) Visit the site (entire length) so as to get a better understanding of the existing situation and how the project will look
4) Produce a concise Bridge Safety Audit Report identifying safety concerns, and in each case recommending how the design should be changed to eliminate or minimise the potential problem. The auditors should consult the appropriate checklist in the "Bridge Safety Audit Manual" but not limit their audit to the concerns listed therein. They must look at the needs of all bridge users, especially vulnerable bridge users. The audit findings should be presented in tabular form, as follows.

Ref:	Findings	Recommendations	Client's Response

5) Attend the project director's Completion Meeting in order to answer questions on the Audit Report and discuss the recommended changes.

Qualifications and Experience

The services will be provided by a team comprising two or more bridge safety specialists, at least one of whom (the team leader) must have experience of undertaking bridge safety audits. Knowledge and experience of bridge design will be an advantage.

Required Inputs

The assignment is expected to take about 9 days, as follows:

- 3 days reviewing the reports and drawings, etc., and holding the Commencement Meeting
- 3 days visiting the site
- 3 days preparing the Road Safety Audit Report.

In addition, it will be necessary for the audit team leader to attend the Completion Meeting. This will normally be held within one month of the Audit Report being submitted.

[Adjust these requirements to suit the scale and complexity of the project]

Reporting

The auditors will submit (x) copies of the Bridge Safety Audit Report to the bridge authority, together with an electronic copy in MS Word.

APPENDIX 2. A Complete Bridge Safety Auditing

Case Study 1: During implementing the bridge construction

Location: Pecharkanda Bazar, Ghior, Manikganj

1. Introduction

1.1 Background

Rehabilitation of 125.18m (100.00m+25.18m Extension) RCC Girder Bridge on Dhulundi-Baliakhora-Pecharkanda Bazer-Shingjuri UP Road at Chainage: 6725m under Rehabilitation category (SupRB/ Manik/ Rehab/ 22-23/W-17). It is situated at Ghior Upazila under Manikganj district. With a lot of roadside permanent stores, stalls, business shades and a bazar area might be deemed a required safety measures. However, with the intersection at west side of bridge, roadside hazards due to stores, large trees, shortage of traffic signs and removal of diversion road prior to completion of approach road and bridge make this area prone to severe collisions and trouble. Understanding this, the maintenance consultancy audit team of program for supporting rural bridges (SupRB) under Local Government Engineering Department (LGED) audited the bridge as a case study for the inclusion in Bridge Safety Audit Manual sponsored by World Bank and Local Government Engineering Department (LGED). The following sections will offer specifics on the audit activities as well as the pertinent outcomes.

1.2 Objective

The main purpose of this audit was to identify and mitigate the hazards associated with bridge safety inadequacies of the concerned bridge. It helps to lower the likelihood of collisions while also reducing the severity of crashes.

1.3 Detail of the Location

a. Road Name : Dhulundi-Baliakhora-Pecharkanda Bazer-Shingjuri UP Road
b. Road Id : 356223005
c. Chainage : 6725m
d. Location Name : Pecharkanda Bazar
e. Inspection Date : 18/03/2025 (Tuesday)
f. Inspection time : 11.20 am
g. Selection : Random

Figure: W-17, Pecharkanda Bazar, Ghior, Manikganj

1.4 Audit Team

Name of the Personnel	Designation
1. Syed Imdadul Haque	Road Safety Specialist
2. Muhammed Mahbubur Rahman	Social Specialist
3. Md. Tawhidul Islam	Junior Bridge Maintenance Specialist

1.5 Audit Stage

Since an under construction bridge with approach road has been inspected, this inspection scenario falls under the category of "Stage 3: Implementation".

2. Supporting Documents used for the Audit

Prior to commencement of the audit, a preliminary investigation was conducted to ascertain the current state of the bridge. A complete overview of the location was captured using Google Earth View. During this phase, nearby approach roads, bridge, traffic flow and pedestrian movement were taken into account. During the audit, a rigorous bridge safety audit checklist was used.

3. Audit Findings

3.1 Diversion Road Issue

Diversion road was constructed for traffics and pedestrians. Unexpectedly, the road was washed away during last rainy season. In such case it was needed to reconstruct the road but it was not done. So, the traffic and pedestrian movement has become risky for about six months.

3.2 Traffic Related Issues

No advance warning sign and speed calming device such as hump were detected before the approach road.

3.3 Pedestrian Related Issues

Pedestrians were considered the most vulnerable road user on the approach road and bridge. Moreover, their oblivious wandering around the location make them a easy target to severe collisions.

4. Recommendations

It is evident from the above that the entire bridge location needs heavy precautionary works to improve traffic safety and pedestrian movement. Though a general suggestion of counter-measures such as traffic signs, warning signboard and reconstruction of diversion road can be presented.

Key Safety Issues	Reference	Items	Quantity
Traffic and Pedestrian movement	SD-11, SupRB	Diversion Road	01
Speed Control Hump	BRTA Manual	B31	02
Precautionary activities	LGED	Warning Notice	02
Traffic sign about work	BRTA Manual	B38	02

Case Study 2: Pre-opening of bridge for traffic and pedestrian

Location: Kushumpur, Serajdikhan, Munshiganj

1. Introduction

1.1 Background

Construction of 13.20m long Box Culvert on Serajdikhan G.C.-Malirranhko R&H Road Via Kusumpur-Nowapara G.C. at Chainage 5750m under Replacement category (SupRB/Mun/Replace/23-24/W-566). It is situated at Serajdikhan Upazila under Munshiganj district. With a lot of roadside permanent homes and business shades might be deemed a required safety measures. However, with the bend of approach road, roadside hazards due to stores, large trees, wrong traffic signs and shoulder obstacle with trees make this area prone to severe collisions. Understanding this, the maintenance consultancy audit team of program for supporting rural bridges (SupRB) under Local Government Engineering Department (LGED) audited the bridge as a case study for the inclusion in Bridge Safety Audit Manual sponsored by World Bank and Local Government Engineering Department (LGED). The following sections will offer specifics on the audit activities as well as the pertinent outcomes.

1.2 Objective

The main purpose of this audit was to identify and mitigate the hazards associated with bridge safety inadequacies of the concerned bridge. It helps to lower the likelihood of collisions while also reducing the severity of crashes.

1.3 Detail of the Location

a. Road Name	: Serajdikhan G.C.-Malirranhko R&H Road Via Kusumpur-Nowapara G.C.
b. Road Id	: 359742004
c. Chainage	: 5750m
d. Location Name	: Kushumpur
e. Inspection Date	: 19/03/2025 (Wednesday)
f. Inspection time	: 10.50 am
g. Selection	: Random

Figure: W-566, Kushumpur, Serajdikhan, Munshiganj

1.4 Audit Team

Name of the Personnel	Designation
1. Syed Imdadul Haque	Road Safety Specialist
2. Muhammed Mahbubur Rahman	Social Specialist
3. Md. Tawhidul Islam	Junior Bridge Maintenance Specialist

1.5 Audit Stage

Since a newly constructed bridge with approach road has been inspected, this inspection scenario falls under the category of "Stage 4: Pre-opening".

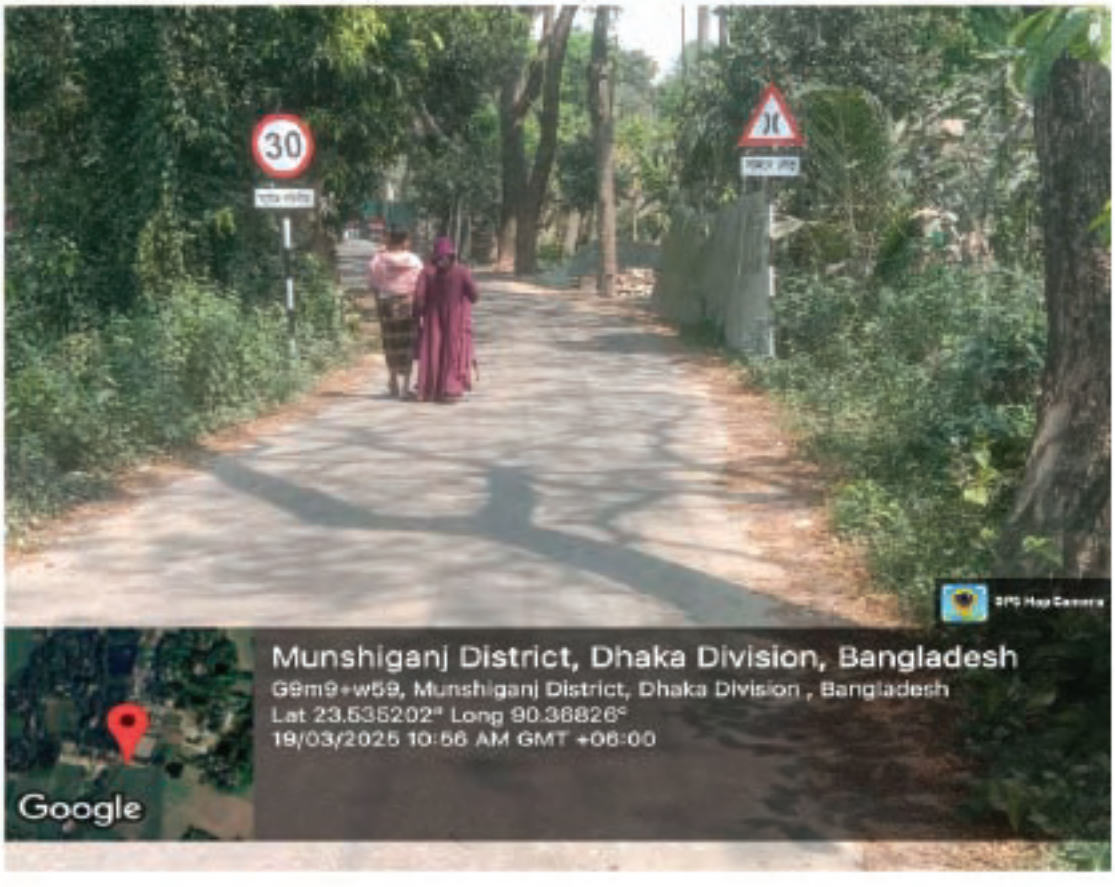
2. Supporting Documents used for the Audit

Prior to commencement of the audit, a preliminary investigation was conducted to ascertain the current state of the bridge. A complete overview of the location was captured using Google Earth View. During this phase, nearby approach roads, bridge, traffic flow and pedestrian movement were taken into account. During the audit, a rigorous bridge safety audit checklist was used.

3. Audit Findings

3.1 Traffic Related Issues

It was found that four traffic signs are placed in a wrong position and symbol. The sign gives wrong message to traffic drivers and pedestrians.

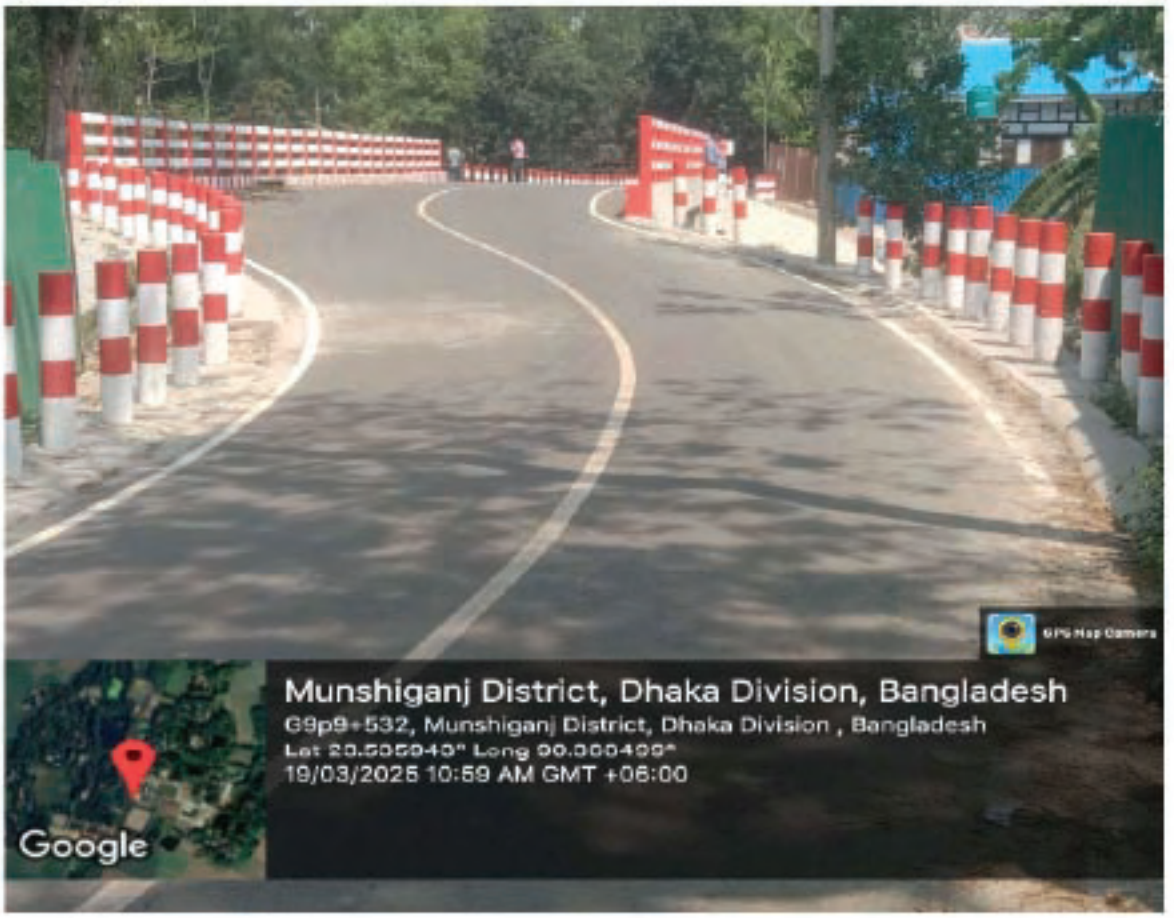


3.2 Roadside Setback Space (Shoulder)

It was found in some portion of the approach road shoulder was unsuitable for pedestrian strolling.

3.3 Sharp Curve Issues

In the assessed approach road curve section was found to be a critical issue. The sharpness of the curve was found to support vision obstruction. Moreover no warning traffic sign was observed on the approach road.



4. Recommendations

It is evident from the above that the entire bridge location needs heavy precautionary works to improve traffic safety and pedestrian movement. Though a general suggestion of counter-measures such as traffic signs, shoulder widening and correct placement of traffic signs can be presented.

Key Safety Issues	Reference	Items	Quantity
Wrong Traffic signs	BRTA Manual	A20 & C24	04
Additional traffic signs	BRTA Manual	B13	01
Speed Control Hump	BRTA Manual	B31	02
Unsuitable shoulder	SD-11, SupRB	About 50m	01
Environmental	SD-11, SupRB	Tree removal	05

Case Study 3: Post-opening and existing bridge

Location: Amirganj, Raipura, Narshingdi

1. Introduction

1.1 Background

Construction of 30.00m long PSC Girder Bridge on Amirganj U.P. office-Monipura G.C. via Masimnagar F.Ghat Road at Chainage: 2716m under Replacement category(SupRB/Nar/ Replace/ 21-22/ W-310). It is situated at Raipura Upazila under Narshingdi district. With a lot of roadside permanent homes and trees might be deemed a required safety measures. However, with the bend of approach road, roadside hazards due to stores, large trees, and narrow shoulder obstacle with trees make this area prone to severe collisions. Understanding this, the maintenance consultancy audit team of program for supporting rural bridges (SupRB) under Local Government Engineering Department (LGED) audited the bridge as a case study for the inclusion in Bridge Safety Audit Manual sponsored by World Bank and Local Government Engineering Department (LGED). The following sections will offer specifics on the audit activities as well as the pertinent outcomes.

1.2 Objective

The main purpose of this audit was to identify and mitigate the hazards associated with bridge safety inadequacies of the concerned bridge. It helps to lower the likelihood of collisions while also reducing the severity of crashes.

1.3 Detail of the Location

a. Road Name	: Amirganj U.P. office-Monipura G.C. via Masimnagar F.Ghat Road
b. Road Id	: 368762001
c. Chainage	: 2716m
d. Location Name	: Amirganj
e. Inspection Date	: 17/03/2025 (Monday)
f. Inspection time	: 11.40 am
g. Selection	: Random

Figure: W-310, Amirganj, Raipura, Narshingdi

1.4 Audit Team

Name of the Personnel	Designation
1. Syed Imdadul Haque	Road Safety Specialist
2. Muhammed Mahbubur Rahman	Social Specialist
3. Md. Tawhidul Islam	Junior Bridge Maintenance Specialist

1.5 Audit Stage

Since the constructed bridge with approach road under use of traffic and pedestrian has been inspected, this inspection scenario falls under the category of "Stage 5: Post-opening and existing".

2. Supporting Documents used for the Audit

Prior to commencement of the audit, a preliminary investigation was conducted to ascertain the current state of the bridge. A complete overview of the location was captured using Google Earth View. During this phase, nearby approach roads, bridge, traffic flow and pedestrian movement were taken into account. During the audit, a rigorous bridge safety audit checklist was used.

3. Audit Findings

3.1 Traffic Related Issues

It was found no permanent traffic signs are placed. Without traffic signs it is not possible to give appropriate message to traffic drivers and pedestrians.

3.2 Sharp Curve Issues

In the assessed approach road curve section was found to be a critical issue. The sharpness of the curve was found to support vision obstruction. Moreover no warning traffic sign was observed on the approach road.

3.3 Environmental Issues

Three matured trees were found on the carriage way of approach road. Moreover one matured tree was found at connection of bend. These are dangerous for the safe movement of traffic and pedestrian.

4. Recommendations

It is evident from the above that the entire bridge location needs heavy precautionary works to improve traffic safety and pedestrian movement. Though a general suggestion of counter-measures such as permanent traffic signs, shoulder widening and tree obstacles removal can be presented.

Key Safety Issues	Reference	Items	Quantity
Permanent Traffic signs	BRTA Manual	A20, A26, B13, B31, C24	06
Speed Control Hump	SD-11, SupRB	Road Hump	01
Unsuitable shoulder at north side	SD-11, SupRB	About 60m	01
Environmental	SD-11, SupRB	Tree removal	04
Curve with uncontrolled access	SD-11, SupRB	Curvature widening	01