FINAL REPORT

On

Road Safety Audit of 300 Kilometer (Dhaka to Katchpur & Daudkandi to Chattogram (N1)-203 km; Joydevpur to Tangail (Elenga) N4-70 km and Banani to Gazipur-27 km) National Highways

CLIENT

Road Design and Safety Circle
Elenbari, Tejgaon, Dhaka
Roads and Highways Department

CONSULTANT

IIFC-JV-HTL

JULY, 2021

IIFC

HeptaTech Limited Dhaka

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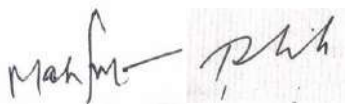

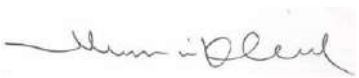

প্রতিস্বাক্ষরিত

(ফাহিজুনা ওয়ারদা)
পরিচিতি নংঃ ৬০২২৮৩
উপ-বিভাগীয় প্রকৌশলী, সওজ
রোড সেফটি বিভাগ
সড়ক ভবন, তেজগাঁও, ঢাকা।

(মোঃ তানভীর সিদ্দীক)
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HeptaTech Limited Dhaka

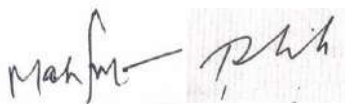
FOREWORD

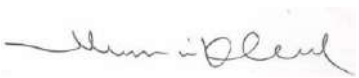
The audit team would like to appreciate the cooperation of 'The Road Design and Safety Circle' of Roads and Highways Department (RHD), Bangladesh during the working tenure for their valuable opinion and guidance on the audit check list, inception report, interim report, and draft final report. The consultant team would also like to express its sincere gratitude to the advisor, Dr. Md. Mazharul Hoque, Professor, Department of Civil Engineering, University of Information Technology and Sciences for his continuous support throughout the project with immense patience, motivation, enthusiasm, and vast knowledge. His continuous guidance helped the audit team during road audit and report preparation. The team would also like to thank Prof. Dr. AKM Fazlur Rahman, for his encouraging and insightful comments. The team wishes to express sincere thanks to Accident Research Institute (ARI), BUET for allowing to use crash data.

The overall contribution from the Centre for Injury Prevention and Research, Bangladesh (CIPRB) during whole project period is highly appreciated.

Special gratitude goes to all the senior officials of RHD in field level and Highway police officials of the audited road length for their valuable advices on existing hazards of the highway.

The consultant team is very much looking forward to work further with Bangladesh government on a roll out of this successful program to other high-risk corridors and highways within the road network in Bangladesh.





EXECUTIVE SUMMARY

The main objective of this project was to assess potential safety hazards on road sections of Dhaka to Katchpur & Daudkandi to Chattogram (N1)-203 km; Joydevpur to Tangail (Elenga) N4-70 km and Banani to Gazipur-27 km, Total 300 Kilometer National Highway using road safety auditing tools and to recommend possible options for remedial treatment. At first existing “Guidelines for Road Safety Audit, 2005” of Roads and Highways Department (RHD), Bangladesh was reviewed as well as guidelines of developed countries were analyzed to find out the improvement options of RHD guidelines. A detailed checklist was prepared addressing the RHD guidelines and other leading road agencies such as Austroads, Indian Road Congress. Crash data was collected to supplement audit findings. Considering the local traffic composition, some new indicators were addressed in audit checklist. Some of the striking issues are: scope of the highway, accessibility, night inspection, hazardous locations, side roads, speed breakers, road users’ behavior, enforcement, non-standard vehicles etc.

Two team consisting of road safety auditors and social scientists conducted the field visits from 10 September, 2020 to 30 November, 2020 to identify possible hazards as listed in the checklist through conducting highway geometric study, site specific deficiencies of road elements, built-up area condition, school zone environment, vehicular and pedestrian composition and related safety issues. Local traffic conditions were critically observed during the whole study. Field observation reveals that along these corridors, drivers of heavy vehicles particularly of buses are always in fierce competition and also have the tendency of making risky overtaking maneuver which is often induced by presence of slow moving vehicles and unaware pedestrians resulting unsafe and hazardous traffic operating condition.

Furthermore, the audit has identified some potential risks that may induce severe road crash at any time. Major flaws addressed during the audit are: absence of access control measures, sharing same track by slow and non-motorized vehicle along with high speed vehicle, increased number of hazardous locations, increased

road side non-motor activities, untreated divider opening etc. For immediate result, the audit team suggested shoulder treatment, additional road sign requirement, road marking installation and adequate facility improvisation on built-up areas of the surveyed 300km highways in details results. In addition to the recommendations made in the audit report, the study also proposed few suggestions to mitigate probable safety hazards to be aroused due to expected rapid urbanization. Worth mentioning suggestions are: strict access control to national highway, development of highway-adjacent land using policy, building up of local road network, upgrading at-grade junctions by constructing grade separated interchange facility etc.

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ABBREVIATION

AADT-Annual Average Daily Traffic

ARI-Accident Research Institute

BRTA-Bangladesh Road Transport Authority

BUET-Bangladesh University of Engineering and Technology

CNG-Compressed Natural Gas

GDP- Gross Domestic Product

GDPPC- Gross Domestic Product Per Capita

GPS-Global Positioning System

HBB-Herringbone Bond

HRL-Hazardous Road Location

LGED-Local Government Engineering Department.

LRP-Location Reference Point

MAAP-Microcomputer Accident Analysis Package

MV-Motorized Vehicle

NMT-Non Motorized Transport

NMV-Non Motorized Vehicle

RHD-Roads and Highways Department

RSA-Road Safety Audit

TOR-Term Of Reference

UN- UNITED NATION

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CHAPTER 1

INTRODUCTION

Transportation is an important aspect of the functioning of the society. An efficient transport system can enhance social, economic, industrial, and commercial progress of the country. In Bangladesh road is a major means of communication, and modal share of road for freight and passenger is more than 75 percent. It is important to provide good road infrastructure for efficient and safe mobility for road users.

1.1 Background:

Road traffic crash is one of the leading cause of death around the world, and kills 1.2 million people annually. It causes about 3% GDP loss for the low and middle income countries like Bangladesh. Road safety has been highlighted in Goal 3.6 of the Sustainable Development Goal (SDG) mandating 50% reduction of global death. Accordingly, RHD has undertaken various initiatives as per National Strategic Action Plan. Road Safety Audit is an important tool for identifying the problems and issues related to road safety. As part of this study RHD has initiated the safety audit of important sections of two national highways N1 and N3..

1.2 Project Objectives:

The main objective of the study is to ascertain whether the safety needs of all road users have been accommodated in the road environment. Important points to be emphasized to attain the objective are outlined below:

- Adequacy of road capacity related to traffic volume and composition of traffic
- Adequacy of street furniture
- Vulnerability due to roadside obstructions and night time visibility
- Issues related to unplanned roadside development and access management
- Adequacy of geometric standards and functioning of junctions

- Adequacy of traffic management and speed control, and effectiveness of traffic enforcement
- Provision for vulnerable road users (pedestrians, school children)

1.3 Outcome of the study:

The final outcome of the study is to deliver a road safety audit report summarizing the findings of the audit based on the field survey data along with recommendation which RHD will adopt in the mitigation of safety hazards.

2. Scope of Service:

2.1 Safety Audit: Carry out road safety audit by reviewing drawings, documents, traffic information, accident statistics, and field visit for

- Existing road N1 (Dhaka to Katchpur section and Daudkandi to Chattogram section-total 203 km).

- Existing road N3 (Banani to Airport section- 7km)

- Under construction road N3 (BRT corridor from Airport to Joyedvpur- 20 km)

- Under construction road (Joydevpur to Tangail-Elenga – 70 km)

2.2 Mitigation Plan: Based on the findings of audit, prepare mitigation plan to overcome the deficiencies

2.3 Transfer of Knowledge: Develop training module for road safety audit, and provide training to RHD staff.

3. Mobilization:

The consultancy contract was signed on August 10, 2020. The consultant mobilized immediately and started their work in their fully equipped office at Mohakhali DOHS area. The consultant has mobilized two vehicles, and required number of GPS equipment and speed gun for carrying out field survey.

3.1 Inception Phase:

The inception phase was only for two weeks, during this period consultant collected documents, started reviewing them, prepared checklist of field survey, and finalized the work plan. The consultant attended the KICKOFF meeting on 27 August, 2020. The consultant's audit team also visited one site to be familiarized with the safety hazard issues, and the initial findings are summarized in inception report.. The consultant also held discussions with the client to finalize the outline of the study and agree on deliverables.

3.2 Technical Approach:

Road safety audit depends on review of existing documents, accident statistics, traffic survey; and detail field survey. Road safety audit needs a systemic approach which is outlined below

- gather information on characteristics of road, traffic, and accident statistics from existing documents

-review and analyze theses information

- carry out field survey to find out deficiencies causing hazards

-coordinate with other stakeholder agencies involved in planning and design of infrastructure, monitoring of quality for vehicles, and enforcement of traffic rules.

-consult stakeholder at community level on socio economic issue, and design of mitigation measures-analyze field survey to identify deficiency, and design mitigation measures

4. Specific Approach:

After reviewing the list of roads to be audited under this study, the roads has been classified under two major categories

A. High speed road under rural and semi-urban setting

- Daudkandi to Chattogram N1

B. Primary road in urban area

- Dhaka to Kanchpur N1, and Banani to Airport road N3

The category A road is mainly used for through traffic as such high speed and safe mobility will be the main focus; whereas the category Broad which is mainly used by urban population involving predominant pedestrian movement, the main focus will be night visibility and pedestrian safety.

The auditors will evaluate the effectiveness of the recently constructed at grade U turns on Airport road, specially merging between different lanes.

C. Construction Stage road zone

- Airport to Joyedvpur Highway N3 & Joydevpur-Tangail-Elenga N4

5. Socio-economic consideration:

It is important to assess socio-economic and political context of road safety hazards in roads of Bangladesh. The consultant identified the socio-economic factors that impacts community at crash locations. The consultant evaluated the existing road safety practices of the road users at local level. The consultant designed a framework for consultation process with the community in designing awareness program as part of mitigation measures.

6. Stakeholder Consultation:

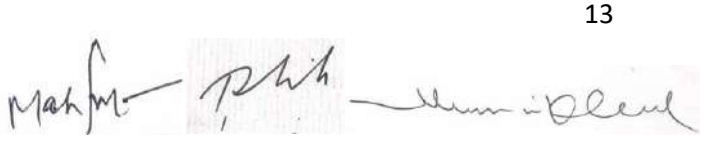
The consultant identified road user groups and local community leader at the field level. The road user group included members of bus and truck owners association, vulnerable users, like pedestrian and school children. While designing mitigation measures their opinion was solicited, specially, in designing awareness campaign.

7. Deliverables

- Inception Report (also to be included in Final Audit Report)
- Minutes of completion meeting (also to be included in Final Audit Report)
- Base maps along with survey data, other supplementary details/data collected through survey investigations in soft font and bard copies in a font that can be used for preparation of further proposals of remedial actions
- Audit report (copies-l soft copy and *5* Hard copy)
- Supplementary Audit Report covering client's observation on audit recommendations and Auditors' response on client's observations (Five copies).

8. Reporting:

The audit report is the final outcome to summarize the findings of the audit team and has made appropriate recommendations to mitigate the deficiencies. The report covers the following aspects



- Project data (road function, traffic situation, road standards, and road surroundings)
- Deficiencies described with reference to existing road chainage and Location Reference Points (LRP)
- Proposed short term mitigation measures (signage, enforcement), medium term measures (speed reductions using traffic calming measures, refuge island for pedestrians, bus lay byes, channelization of intersections), and long term measures (service lane, grade separation etc.)
- Appendix**:** maps, illustrations, sketches and photos to clarify the findings
- Completion Meeting will be held with the participation of safety auditors and client (design team) where the auditors will explain the findings of the audit report. The feedback from the discussion will be complied in the minutes of the meeting. The consultant will take note of the comments from the client and submit a supplementary audit report.

9. Special Issues

a. Integrated corridor management: For the sustainable reduction of road crashes, an integrated rod safety program covering the aspects of vehicle, road users, surrounding environment, and enforcement is essential. For major highways which are being widened now (like Dhaka-Tangail Highway) the corridor management concept covering operation and management (including road safety management) the integrated approach was initiated.

b. Motorcycle: Due to inefficient public transport, the number of motorcycle riders are increasing rapidly in Dhaka, during peak hour the left lane is totally blocked causing obstruction for left turning vehicles and movement of bus. At times, motorcyclists also use sidewalk causing safety hazards for the pedestrians. While designing the mitigation measures these issues was taken into consideration.

CHAPTER 2

PROJECT MANAGEMENT

The project is a joint effort of HeptaTech and Infrastructure Investment Facilitation Company (IIFC) with the continuous support from Technical Service Wing of Roads and Highways Department. Experts from HeptaTech played the key role with all sorts of technical expertise. Project officials from different professional sectors were recruited prior to starting the activities. The project was initiated in field with initial field visit which resulted a detailed checklist and later on a detailed road safety audit. Following table & figure are illustrating the total project management in brief:

1. **Road Safety Audit Team**

The following Personnel were engaged for the project for whole project duration:

Table 2.1: **Road Safety Audit Team**

Name of Personnel	Designation	Company Name
Engr. Mohi Uz Zaman Quazi	Team Leader	HeptaTeach Limited
Engr. Probir Gopal Roy	Project Coordinator	HeptaTeach Limited
Engr. Mushab Bin Khondker	Field Coordinator	HeptaTeach Limited
Kazi Zahirul Islam	Office Coordinator	HeptaTeach Limited
Engr. Motiur Rahman Saimon	Traffic Controller	HeptaTeach Limited
Engr. shahinuzzaman	Planning and Strategy	HeptaTeach Limited
Engr. Arman Nasir Khan	Road Safety Engineer	HeptaTeach Limited
Engr. Kuntal Biswas	Road Safety Engineer	HeptaTeach Limited
Md. Kabir Hossain	Statistician	CIPRB
Kazi Burhan Uddin	Social Scientist	CIPRB
Mr. Nayem Uddin	Social Scientist	CIPRB

2. Services -

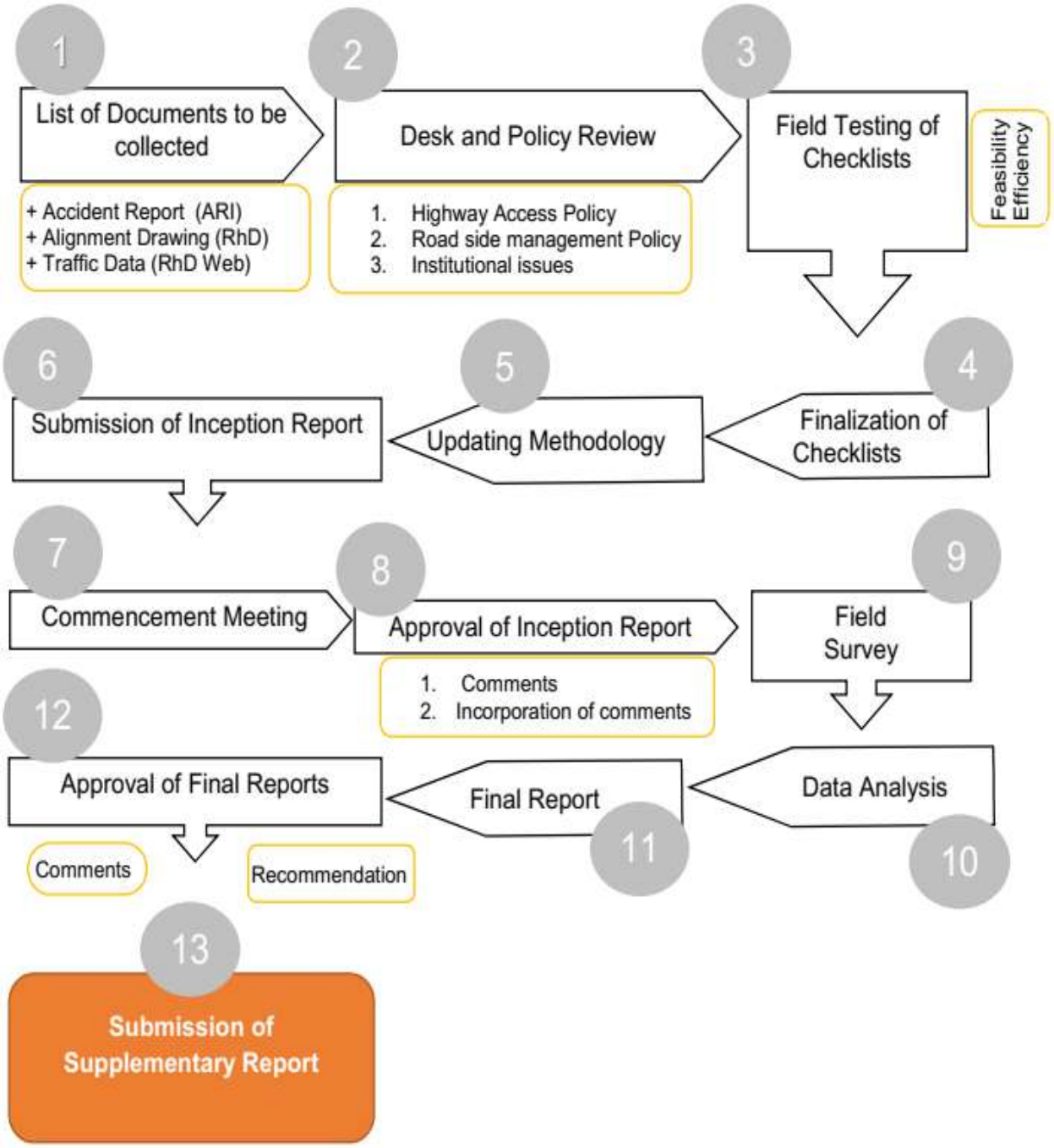


Figure 2.1: Project Management of RSA (services)

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There are several agencies responsible for ensuring road safety (RHD, LGED, Highway Police), as such effective coordination at HQ level and field level is very important. It is expected that client will provide necessary support to the consultant in collecting documents and information from these agencies. In addition, discussion with road safety research organization (ARI of BUET) will be held.

3. Collection and Review of Documents:

Due to very limited time for the study, the consultant explored the possibility of using secondary data as much as possible. The consultant has identified following reports and drawings for the study, and hoped the client would help the consultant in acquiring these documents:

- Traffic volume counts on the road sections proposed under the study
- Accident records on respective road sections
- Road safety drawings of road sections under construction and recently completed
- Plan of Kuril flyover
- Plan of interchange at Banani and Abdullahpur for Dhaka Elevated Expressway
- Design of U turn on Airport road.

4. Implementation Risks:

Timely receipt of required documents from RHD and other stake holder agencies was critical for the study. The consultant appreciates client's full cooperation in this regard. Currently the country is passing through COVID 19 situation and the study was effected as second wave of virus emerged during the study period.

5. Project Work Plan

5.1 Desk Review

The consultant started desk review of the project roads through the use of Google map which was a broad indication of urbanization, vegetation, and junctions along the road. Desk review also included review of drawings related to road alignment, review of accident reports and traffic survey report. The consultant expected to complete the desk review within the month of September. The consultant also reviewed the access policy on national highway for ensuring planned urbanization along the road to facilitate the movement of through traffic. Jurisdiction of Highway Police and institutional responsibility of local bodies (within built up areas) along the national highway was reviewed to ensure safe movement of through traffic.

5.2 Field Survey

Three teams were mobilized to carry out field survey to collect information on the existing situation of the road related to safety audit. A check list had been prepared to capture the shortcomings. A field visit was conducted on Banani-Airport highway on September 9, 2020 which was participated by the whole project team. During this trip the audit checklist was field tested and fin tuned. The initial findings of the team are summarized in the Inception report. During field survey traffic mix and traffic volume will be assessed on random basis. Any special feature or road side activity causing impediments to safe vehicular movement will also be noted.

During field survey, the team ensured the safety of themselves in all respect. They wore the safety vest and the both indicator light of back and front side was on during slow movement of the vehicle.

5.3 Analysis of Data

The information of field survey was analyzed for specific issues like adequacy of street furniture, adequacy of sight distance, appropriateness of road and shoulder condition, impact of roadside activities and fixed obstructions, traffic composition and speed.

5.4 Findings

The findings are summarized for each road separately. The consult divided the corridor in homogeneous sections in term of adjacent land use and provide summary for these sections, mostly in the form of charts and tables.

5.5 Recommendations

Road crashes are not only related to the road engineering issues but are also linked with the road user's behavior, roadside environment, and effectiveness of enforcement. Although not part of the TOR the consultant has provided some recommendation on these issues for each road corridor. The consultant also reviewed the current institutional aspects of road safety management especially along built- up areas and provided some guidance.

5.6 Discussion with Client

The checklist of field survey, work plan, methodology and deliverables as outlined in the inception report was discussed with client prior to the start of the field survey.

6. Project Scheduling:

6.1 Project Activity

The Project Activities are as follows –

- Team Formation
- Team Orientation
- First Field Test
- Second Field Test

- Preparation of Check List
- Submission of Inception Report
- Document Collection
- Desk and Policy Review
- Commencement Meeting
- Meeting Minutes sign off
- Site Visit Banani to Airport (T1)
- Site Visit Dhaka to Kachpur (T2)
- Site Visit Daudkandi to Chattogram (T3)
- Site Visit Airport to Joydebpur (T4)
- Site Visit Joydebpur to Mymensingh-Elenga (T5)
- Documentation of Information Collected from Field
- Analysis of Field Data
- Summary and Documentation
- Interim Report
- Final Report
- Supplementary Report

6.2 Activity Flow

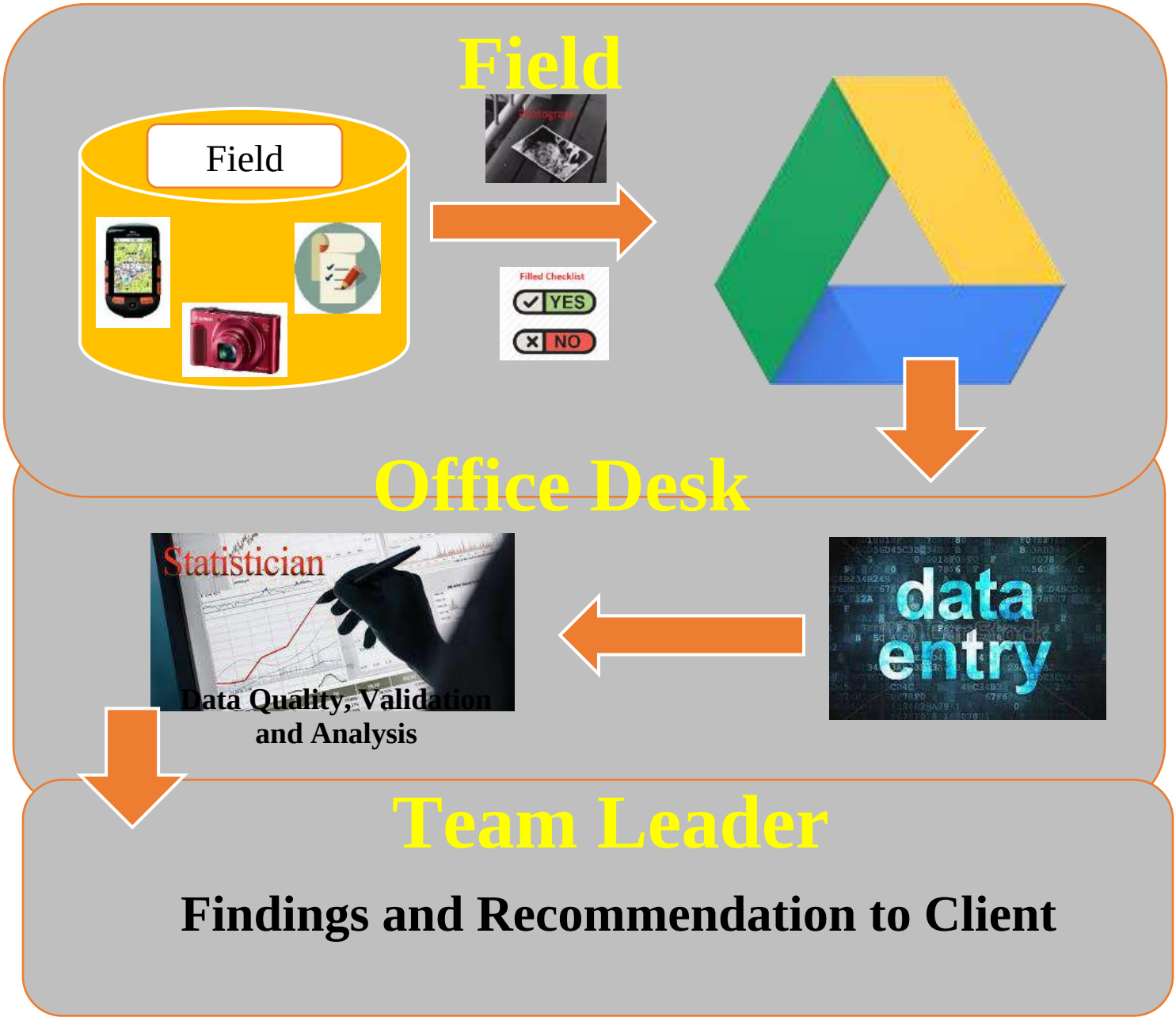

Figure 2.2: Activity flow of Road Safety Audit Project

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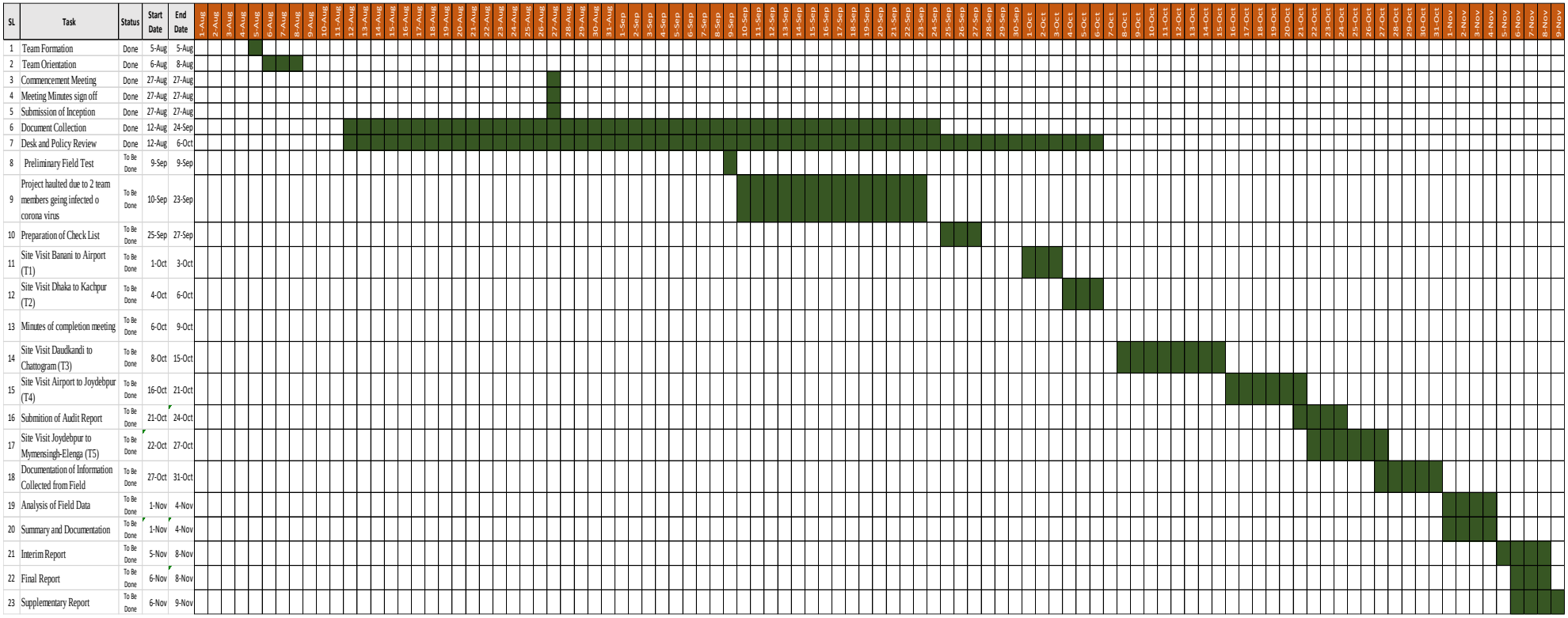
6.3 Schedule

Schedule (Work Plan)



SL	Task	Status	Start Date	End Date
1	Team Formation	Done	5-Aug	5-Aug
2	Team Orientation	Done	6-Aug	8-Aug
3	Commencement Meeting	Done	27-Aug	27-Aug
4	Meeting Minutes sign off	Done	27-Aug	27-Aug
5	Submission of Inception	Done	27-Aug	27-Aug
6	Document Collection	Done	12-Aug	24-Sep
7	Desk and Policy Review	Done	12-Aug	6-Oct
8	Preliminary Field Test	To Be Done	9-Sep	9-Sep
9	Project haulted due to 2 team members geing infected o corona virus	To Be Done	10-Sep	23-Sep
10	Preparation of Check List	To Be Done	25-Sep	27-Sep
11	Site Visit Banani to Airport (T1)	To Be Done	1-Oct	3-Oct
12	Site Visit Dhaka to Kachpur (T2)	To Be Done	4-Oct	6-Oct
13	Minutes of completion meeting	To Be Done	6-Oct	9-Oct
14	Site Visit Daudkandi to Chattogram (T3)	To Be Done	8-Oct	15-Oct
15	Site Visit Airport to Joydebpur (T4)	To Be Done	16-Oct	21-Oct
16	Submition of Audit Report	To Be Done	21-Oct	24-Oct
17	Site Visit Joydebpur to Mymensingh-Elenga (T5)	To Be Done	22-Oct	27-Oct
18	Documentation of Information Collected from Field	To Be Done	27-Oct	31-Oct
19	Analysis of Field Data	To Be Done	1-Nov	4-Nov
20	Summary and Documentation	To Be Done	1-Nov	4-Nov
21	Interim Report	To Be Done	5-Nov	8-Nov
22	Final Report	To Be Done	6-Nov	8-Nov
23	Supplementary Report	To Be Done	6-Nov	9-Nov

Figure 2.3: Road Safety Audit Project Time Schedule

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CHAPTER 3

GENERAL OBSERVATION DURING AUDIT

Identified road users by survey team on the highway were:

- General public
- Commercial transport operators
- School vans
- Commercial bus operators
- Pedestrians
- Bicyclists
- Motorcyclists
- Agricultural machinery
- Tempo, Nosimon, Karimon

·The survey section adjacent land of the highway was encompassed with

- Commercial shops and bazars
- Agricultural farms
- Petrol station
- Residential dwellings
- Rural residential development
- Schools
- Heavy vehicle operators and repair shops
- Roadside stalls
- Community recreation areas
- National park
- Port

Traffic and behavioral characteristics of the surveyed road length were:

- Heterogeneous vehicle composition was seen though heavy trucks and buses were dominating but low speed operated minibuses, tempos and other non-standard vehicles, particularly NMVs had regular access in the junctions from side roads.

- The heavy vehicles parked on either side of the road caused congestion.
- Frequent presence of roadside hazards like tree, pole or structures.
- Tendency of violation of traffics signs and markings like driving over speed limit, high speed intersection traffic, overtaking on curves etc.
- On Construction Zone area compliance of safety was poor.

Pedestrian activities and facilities of the surveyed road length were:

- There were very few dedicated pedestrian sidewalk or crosswalk facilities and refuges on most length.
- No barriers or pedestrian guardrails had been provided to regulate their movements and for exposing them on significant danger.
- Unpredictable road crossing of pedestrian was seen as few zebra crossing/over bridges were present.
- Unprotected school zones with lacking of pedestrian facilities for safe movement forcing to walk on highway road.
- Undetectable or faded zebra crossing marking and raised pedestrian facilities for drivers.

CHAPTER 4

AUDIT PROCESS AND METHODOLOGY

The Road Safety Audit

The Austroads Guide to Road Safety Part 6: Road Safety Audit (2009) defines an RSA as: “a formal evaluation of an existing or future road or traffic project or an existing road, in which an independent, qualified team reports on the project’s crash potential and safety performance.”

An audit is not a check against standards. Compliance with standards, which may represent the minimum requirements, does not guarantee safety.

The essential elements of this definition are that the audit is:

- A formal process and not an informal check
- An independent process
- Carried out by someone with appropriate experience and training
- Restricted to road safety issues.

The objectives of an RSA are:

- To identify potential safety problems for road users and others affected by a road project
- To ensure that measures to eliminate or reduce the problems are considered in full.
- The benefits of conducting RSAs include:
- The likelihood of accidents on the road network can be reduced
- The severity of accidents can be reduced.

The aim of an RSA is:

“To identify any existing safety deficiencies of design, layout and road furniture, which are not consistent with the road’s function and use. There should be a consistency of standards such that the road user’s perception of local conditions assists safe behavior.”

Stages of Road Safety Audit

Audit may be carried out for all or any number of the following stages of road planning, design, construction and maintenance:

1. Feasibility Study
2. Preliminary Design
3. Detailed Design
4. Road under construction
5. Pre-opening stage of construction completed
6. Existing Road
7. Traffic Management Scheme During Road Construction

As per TOR, the audit of existing road has been conducted in this project.

A. Methodology of Safety Audit on Existing Road

Audit of existing road was carried out through a systemic review by safety auditors to identify hazardous condition, faults and deficiencies that may lead to serious accidents. Auditors investigated following key areas for the existing road safety audit:

- Function of the road
- Cross section of the road
- Road alignment
- Intersections
- Road side properties and access management
- Roadside facilities
- Visibility
- Vulnerable road users
- Street furniture

The auditors carried out preparatory work in the office and field study. The desk study covered review of drawings, reports and information related to traffic and accidents. The field study identified deficiencies at specific locations by collecting information

following a checklist (see ANNEX- B). During the field study adequate safety measures was taken by the consultant's field team.

B. Audit during Construction Stage: All road construction projects *interact* with travelling public as such there is potential for crashes due to

- Changes in the road layout
- Drivers or pedestrians not able to adjust their behavior to match the changed conditions
- Conflicting use of road spaces between works traffic and public
- Conflicting messages between permanent features and temporary features
- The limited space in which errors of judgment may cause crashes
- Traffic arrangements during roadwork can change several times bearing no resemblance to permanent arrangements
- Construction contractors usually do not appreciate the importance of traffic management, roadside safety, and the operation of safety device

The audit team carried out assessment of proposed temporary traffic management plans for each different configuration or staging of traffic (if possible). The audit team inspected the site covering the aspects of temporary traffic management features as outlined in the construction contract (details of safety measures for road works). The site visit was carried out in day light and at night. Time permitting the audit team was carried out pre-opening audit to certify that all temporary traffic safety features have been removed. Check list construction stage audit is shown in ANNEX B. **The checklist for construction zone audit has been developed based on MANUAL ON ROAD SAFETY AUDIT by INDIAN ROAD CONGRESS- 2010.**

Steps Involved in Road Safety Audit Process are as below.

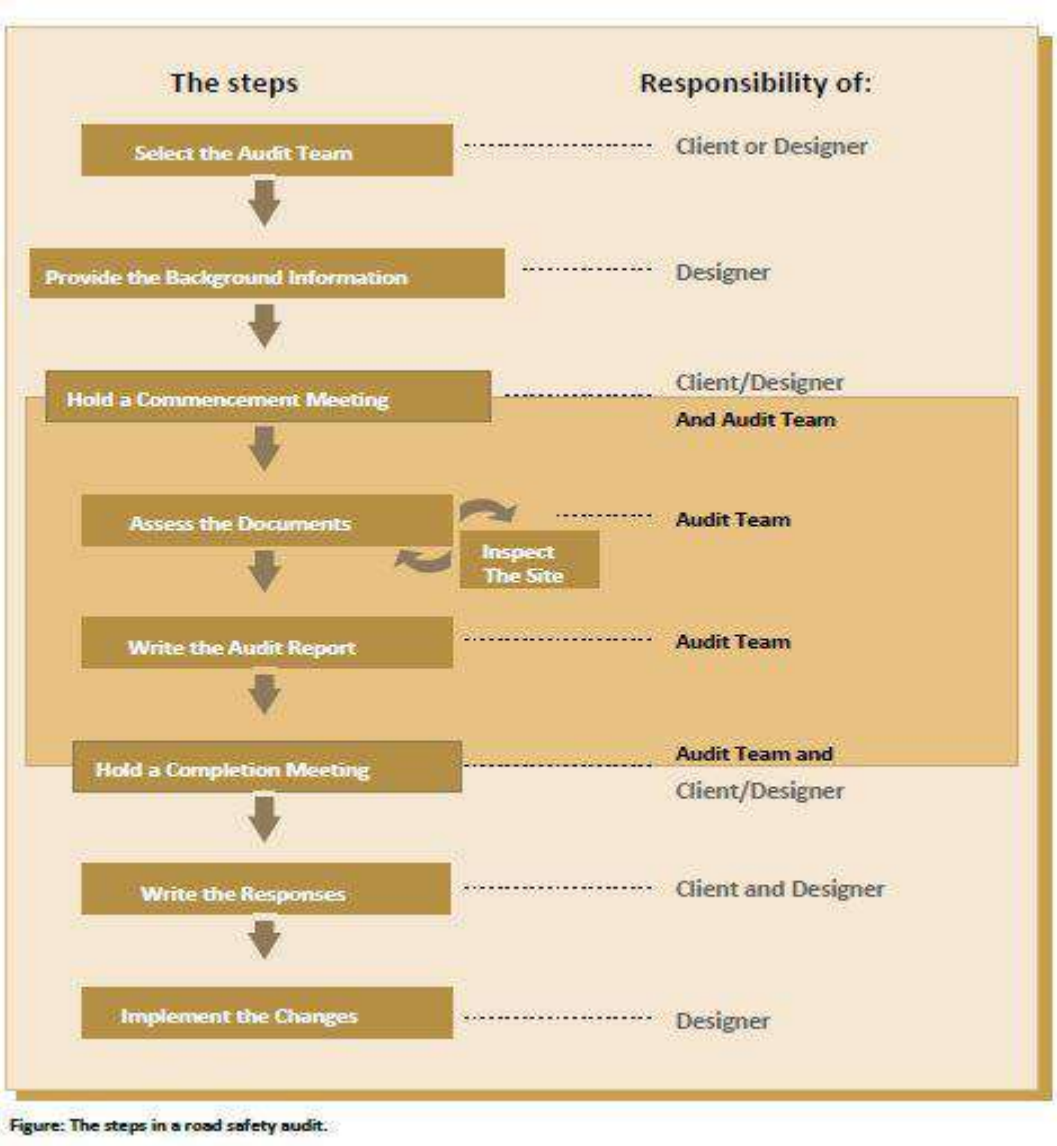


Figure 4.1: The steps in a Road Safety Audit

The brief steps are as follows -

1. Selecting road safety audit team

Each audit team comprised of three members, as the proposed project is vital and large. The team consisted of road safety Auditor, road safety engineer and social

scientist. One of the team members nominated as Road Safety Audit Team leader. In case of requirement, retired police personnel will be diploid for a limited time to provide advice on the relevant issues.

2. Providing the background information

The client should arrange to provide all the necessary information and documents in a usable form for the audit team. Information will include project reports, design details, data, drawings, etc. It may be necessary to collect additional information, such as traffic volumes, vehicular speed, etc. This should be considered early enough to avoid delays to the road safety audit process. As a minimum, the audit team is to be provided with the following documents

- Statement of 'the Expected Outcome
- Project Intent
- Site data
- Plans and Drawings

3. Commencement meeting

After the consultant auditors made visits to the stretch and acquainted themselves with the existing site conditions, a commencement meeting with the participation of auditors, client and design team of client, was organized to understand the context of road safety audit on selected stretch, to share the perceptive of auditors, client and design team if any, as per guidelines. Minutes of the meeting drawn by Audit team bringing out salient issues discussed in the meeting. The audit team's task is to identify and document any road safety concern and recommendations.

4. Assessing the documents

This phase takes place at the same time as the site inspection, the documents being reviewed both before and after the site visit. Before inspecting the site, initially study the documents to record the first impressions: list possible issues to be checked on site. Plans and drawings, traffic and accident data and other information were assessed.

5. Inspecting the site

This gives the audit team the opportunity to see how the project interacts with the surroundings and to visualize the potential obstacles and conflicts, which the road user is likely to encounter.

Prior to the site inspection the team prepared separate checklist for day time and night time audit. The inspection carried out from the point of view of all road user groups and not just motorists.

6. Road inventory

Highway features determine road traffic safety, besides road capacity and economic traffic operations. Highway features are visible elements of highway and consist of various components. So, the safe and efficient operation of highway is governed by road geometric parameters, traffic control devices, lighting system of the stretch, composition of traffic, drainage condition, junction layout, parking facilities, cross drainage structures and the adjoining land use of the stretch.

Road geometry comprises parameters like road width, shoulder width, footpath, height of embankment, sight distance, horizontal curvature, vertical curvature, etc. The traffic control devices comprise signs, markings, delineators, crash barriers, guard rails, etc.

7. Preparation of safety audit report

The report contains the features of the project, deficiencies which involve hazards and make recommendations about corrective actions. The recommendations will reflect sound judgment 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.

Major parts of the reports are as below.

a. **Project information**
b. **Background information:**
c. **Findings and recommendations**
d. **Formal statement**

8. Responding to the audit report

When audit report is received, it has to be acted upon so that safety is enhanced. The objective is to deal with audit recommendations in an effective and objective manner; to decide whether and how the recommendations of the road 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.

Client will furnish the auditors with their observations/views on audit recommendations within 15 days of submission of Audit Report. The auditors shall furnish to the client within 15 days of furnishing the observations/ views of client on audit recommendations, a supplementary audit report providing auditors' response on observations/ views of client on audit recommendations. Final audit report shall be sum of originally submitted audit report (auditor's recommendations) and supplementary audit report (i.e., client's observations/ views on auditor's recommendations together with auditor's response on client's observations/ views on audit recommendations)

9. Implementing the agreed recommendations

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 a serious problem is identified, temporary warning, delineation or other treatment may be needed until the agreed solution is implemented.

10. Completion meeting

A completion meeting with the participation of the Auditors, Client and Design team of client if any, has to be organized in which the safety concerns, observations and

perceptive of the auditors could be explained and discussed to understand the constraints and views of the client on those safety concerns, observations and recommendations. Salient issues discussed in brief may be brought out in the minutes of the meeting drawn by audit team.

Collection and Review of Documents and Maps

The consultant has requested RHD for the alignment drawings of the Dhaka-Chattogram roads, however no drawings could be made available to them. Google maps were used to obtain firsthand information on the alignment and surroundings of the road which will be then validated during field survey. Inform on accidents on the project corridors has been collected from Accident Research Institute (ARI) and being analyzed. Traffic survey reports on these corridors have been collected and being reviewed. The documents used are –

- Accident Data from Accident Research Institute
- Traffic Data from Roads and Highways Website

CHAPTER 5
RESULTS (N1)

Dhaka-Chattogram (N1)

Surveyed Length: 203km with 100m interval on both sides of the road

Salient Features of the Study Segment of N1

The N1 (Dhaka–Chattogram) Highway, length 462.25km, is a main transportation artery in Bangladesh, between Dhaka and Chattogram. This road links the country's two largest cities, Dhaka and Chattogram. The highway is known along various stretches as the Dhaka to Kanchpur Highway, Daudkandi to Chattogram Highway, Chattogram–Cox'sBazar Highway and the Cox'sBazar–Teknaf Highway. The road safety audit of Dhaka to Kanchpur Highway and Daudkandi to Chattogram Highway was conducted during 3 October to 27 October, 2020. The surveyed road mainly is a 6 lane highway with average width of around 18.8m with no NMT line. The road has a standard shoulder of 1.5m and verge/earthen shoulder of 1m.

Road infrastructures details are:

- Major bridges (lengths more than 100m): 3 numbers
- Minor bridges (lengths less than 100m): 42 numbers.
- Culverts: 137 numbers

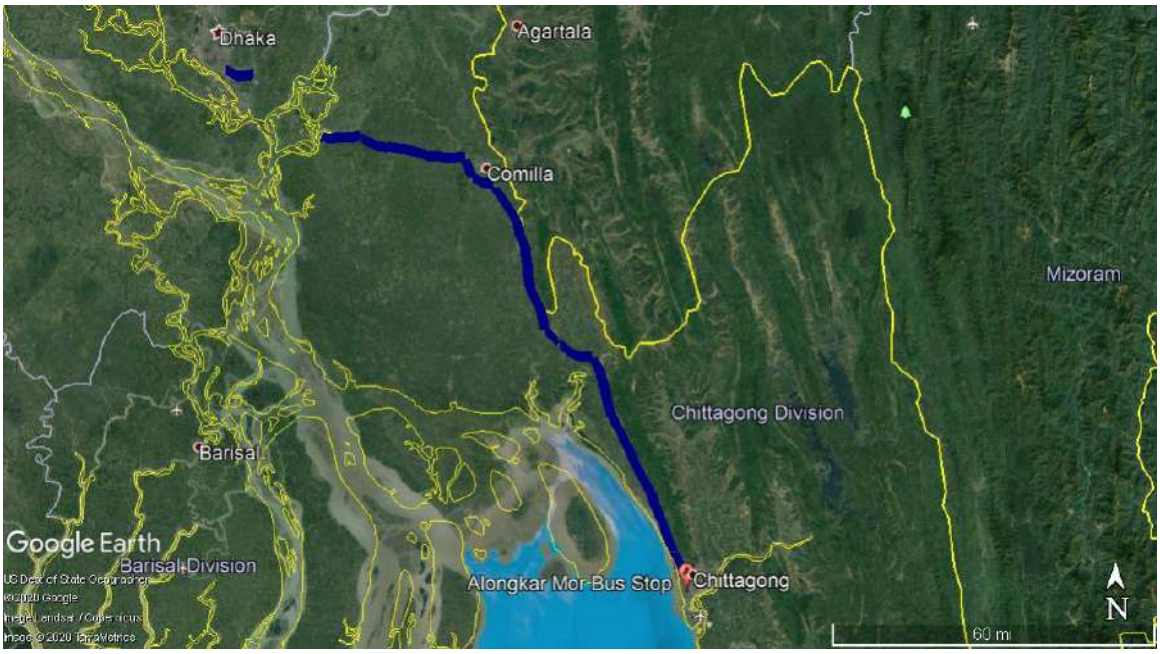


Figure 5.1: Road Section of Dhaka to Kachpur & Daudkandi to Chattogram Cox'sBazar Highway [Source: Google Earth]

Traffic Data

N1 is the busiest road in the country and a top development priority. The AADT (Average Annual Daily Traffic) of this road is 13583 (Motorized: 13129, Non-Motorized: 454).

Road Traffic Injury and Crash Data

Police reported Injury and crash statistics (2011-2015) [Source: ARI-BUET] based on statistical analysis shows that since 2011, about 145 crashes were responsible for about 129 fatalities on this highway section of 203km. So, almost 1 fatality occurs in each 1.5km of the surveyed section. The most dominant crash type on this section was hit pedestrian (39%), head on collision (27%) and others consisted the rest 34%. Geometrical feature, overtaking tendency on this mostly single carriageway highway is the prime cause of high head on collision percentage. The geometrical crash study indicated that 94% crashes took place in the straight sections of the highway compared to only 6% on curves, which referred to the high speed and reckless driving as major concerns for treatment of the highway

Injury and crash statistics (2016-2019) based on newspaper [ANNEX-F] reported statistics shows that 103 accidents took place in Dhaka-Kanchpur Section causing 102 fatalities and 270 accidents on Daudkandi-Chittagong section caused 389 fatalities. .

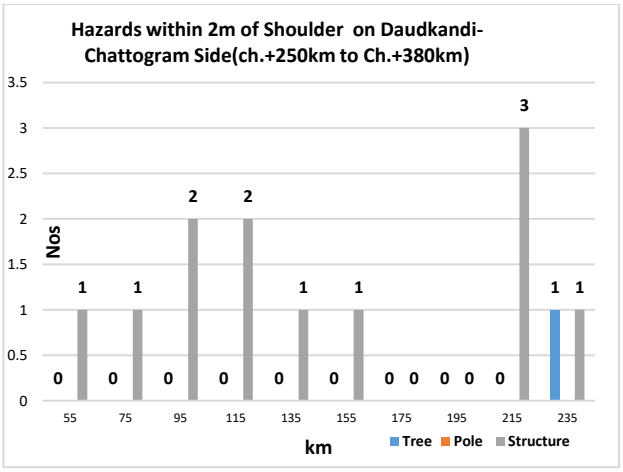
The most dominant types crash on this section were hit pedestrian (40%), vehichal overturned (19%) rear end collision (18%) and others consisted the rest 22%. In Dhaka-Kanchpur Section most accidents took place in Jatrabari and Daudkandi-Chittagong section most accidents took place in Daudkandi and Mirsorai.

Audit Findings

Audit team surveyed Dhaka-Kanchpur Section (Ch.+0.00km- Ch.+8.00) starting from Jatrabari to Kanchpur Bridge toll plaza and (Ch.+38.04 km-Ch.+233.04) starting from Daudkandi to Chattogram,total 203 km. For detail information on Daudkandi-Chattogram (N1) highway, check ANNEXURE-C and ANNEXURE-D.

a. Road Side Hazards (Daudkandi to Chattogram)

- Roadside hazards were those temporary /permanent structures along the road which might increase crash severity if hit by vehicle. Audit team considered 2m width after the pavement and counted permanent/ temporary structures, trees (diameter more than 6cm) and steel poles.
- Roadside clear zone occupied by temporary structure 0.8km (0.4%) on left side whereas permanent structures (mainly concrete structures) occupied around 0.4km (0.2%) roadside length during journey from Daudkandi to Chattogram. From Chattogram to Daudkandi, temporary structures occupied 0.4km (0.2%) whereas permanent structures (mainly concrete structures) occupied around 0.1km (0.1%) roadside length.
- Combining both sides, surveyed road of N1 consisted only 1 tree and no poles within 2m from hard shoulder edge.
- Average 1 road side hazard on every 15km and maximum 5 hazards on every 20km were identified on Daudkandi-Chattogram Highway. Along the Chattogram to Daudkandi side, average 1 road side hazard on every 39km and maximum 3 hazards on every 20km were identified.



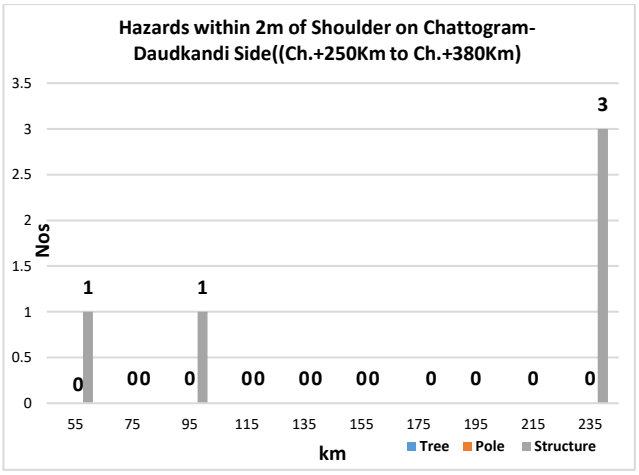


Figure 5.2: Hazards within 2m of Shoulder on Daudkandi-Chattogram Highway (N1) (Both Sides)

- On Daudkandi-Chattogram highway, Flyovers were considered as highway road and the Audit team found no road side hazards were observed.
- On Daudkandi-Chattogram highway, 9.5km (4.75%) verge/earthen shoulder was either missing or less than standard dimension of 1m for any emergency traffic movement. 24.2km (12.00%) was found waterlogged, 110.50km (54.8%) was covered by bushes and 15.9km (7.9%) was occupied by parked vehicles, materials and garbage. A total of 39.7km (19.7%) earthen shoulder was found sufficient (at least 1m width) but 1.9km (1%) had highly risky edge drop and elevated edge (more than 3-inch height) which were creating traffic vulnerability.
- On Chattogram-Daudkandi highway, 10.0km (5.1%) earthen shoulder was either missing or less than standard dimension of 1m for any emergency traffic movement. 13.0km (6.6%) was waterlogged, 134.5km (67.9%) was covered by bushes and 12.9km (6.2%) was occupied by parked vehicles, materials and garbage. Out of total, 195km earthen shoulder, 26.6km (13.4%) was sufficient (at least 1m width) but only 1.0km (0.2%) had risky edge drop/elevated edge(Risky shoulder is defined as earthen shoulder being in higher/lower elevation than the road elevation) which were creating traffic vulnerability.
- Immediate measure required chainages of roadside hazards are given in ANNEXURE-A.

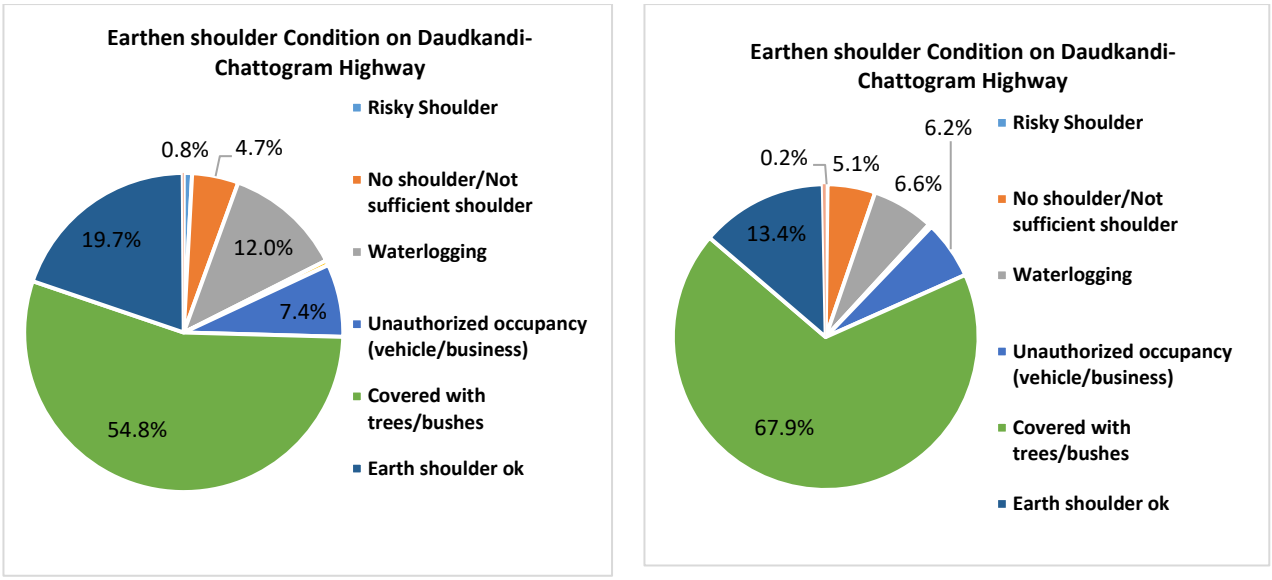


Figure 5.3: Earthen Shoulder Condition on Daudkandi-Chattogram Highway (N1) (Both Sides)

b. Signs (Daudkandi to Chattogram)

- In most cases, necessary regulatory, warning and information signs were not in place. Existing signs were not quite conspicuous and clear. In some cases, no regulatory, warning or information signs was placed. Sometimes non-conventional signs were placed at the center of carriageway without any engineered treatment
- A total of 835 signs were found in both sides of the highway which were mainly U-turn, A26,B3, A28,B25,,A32. B13, C13 etc.
- Some of the existing signs were not visible due to road side activities such as roadside shops, billboards on street parking, temporary gate installed on the road etc. Some signs were not at all visible due to vegetation and some were not visible from a distance due to vegetation. Some signs were ineffective and illegible due to faded color in the background, letters, signs and borders. Team observed 156 signs (N.B: ANNEXURE-A) having such problems.
- According to BRTA manual, for an 80km speed highway, the sign should be placed 150m far from object which was not seen in most of the cases along the road length. Team found a total of 25 signs (N.B: ANNEXURE-A) which were very close from the hazard and very hard to understand by moving traffic.

- Audit team suggested to put additional 547 signs along the highway which are required but missing and mandatory to make the road safer which are mainly A32, B3, B25, C2 etc. A list of additionally required signs suggested by audit team has been given on ANNEXURE-A.
- The team explored total number of 728 signs that needs to be prepared/ installed.

c. Pavement Stature (Daudkandi to Chattogram)

- On Daudkandi-Chattogram Highway Side 184.7km (94.7%) of the pavement of 195km was mostly satisfactory whereas 9.0km (4.6%) was distressed; rest 1.3 km (0.8%) pavement had potholes, waterlogging (N.B: ANNEXURE-A) which were creating serious vulnerability. On Chattogram-Daudkandi Highway Side 190.4km (97.6%) of the pavement of 195km was mostly satisfactory whereas 2.10km (2.1%) out of 195Km was distressed.

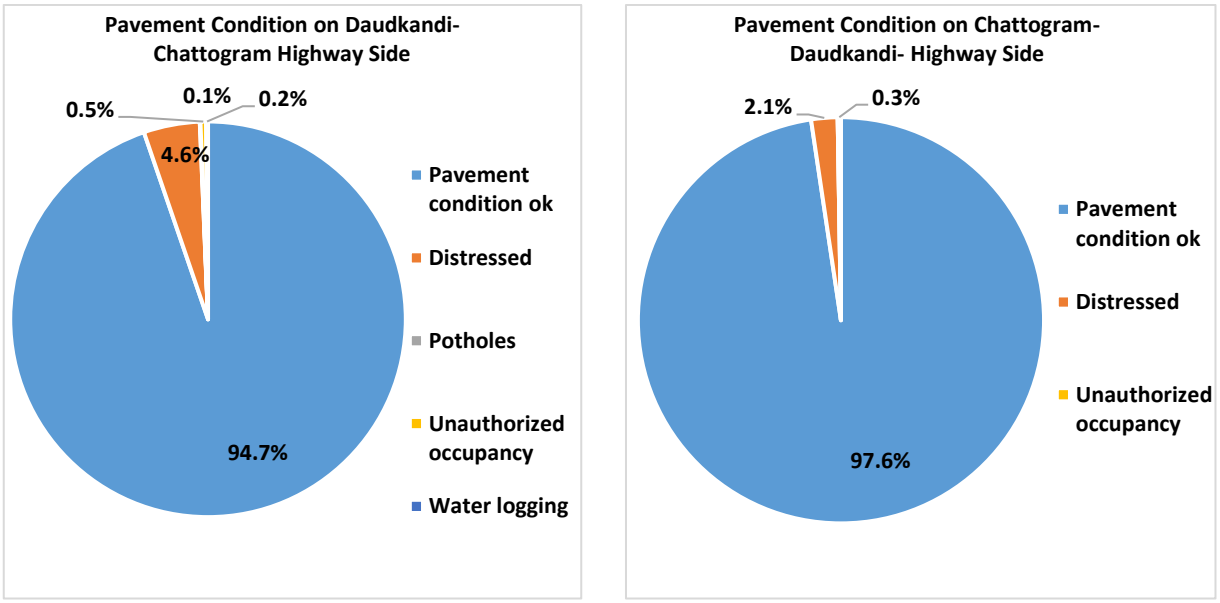


Figure 5.4: Pavement Condition on Daudkandi-Chattogram Highway (N1)(both sides)

- The roadway had overall 26.7 km of mild curves on Chattogram-Daudkandi Highway where drivers do not have to take sharp turns. The Audit team drove through the curvy sections with allowable speed limit of 40Km/hr and did not face any difficulty in taking turns which indicates the road does not require curve widening as per RHD Road Geometric Design Manual 2005. Hence 40km/hr speed seems to be appropriate

- Almost 40.3km on left side of Daudkandi-Chattogram Highway had inadequate hard shoulder width (less than 1.5m) which did not meet RHD standard though 134.6km shoulder was properly maintained. On the right side of Chattogram-Daudkandi, 43.5km had inadequate hard shoulder and rest section was found appropriate as per design standard.
- Overall Centerline road marking was visible but needs maintenance as they were being faded and edge lines got faded on most of the road length.
- Median was available through 166.10km part of the highway section of which 123.60km was covered with bush/vegetation, median color is faded and surface not retro-reflective which can cause unwanted collisions.

d. Parking Facilities (Daudkandi to Chattogram)

Survey team found 128 locations on Daudkandi-Chattogram Highway Side and 106 locations on Chattogram-Daudkandi Highway Side where road was being occupied by illegal road side parking which indicates the necessity of formal parking facility along the road way. 47 formal parking was found on Daudkandi-Chattogram Highway Side and 52 formal parking on Chattogram-Daudkandi Highway Side where the team suggested to provide parking facilities in 3 locations immediately (Ch.+45.14, Ch.+45.24, Ch.+212.54).

e. Bus Stand (Daudkandi to Chattogram)

The surveyed length had 42 bus stand facilities, 19 of them on Daudkandi-Chattogram Highway Side and 23 on Chattogram-Daudkandi Highway Side. 20 of them were too close to an intersection (within 50m), 29 of them had proper accessibility facilities, 25 of them had no Bus Stop sign available, 34 of them had proper busbay facilities, 27 of them had pedestrian crossing facilities nearby to access the busstop, 79 of them had acceleration/deceleration lane for vehicles and none of them had proper lighting facilities.

f. Bridges/Culverts (Daudkandi to Chattogram)

The survey team found 137 culverts, 42 small span bridges (Width less than 100m) and 3 medium size bridge (width between 100m and 500m). Thirteen of these bridges were creating bottleneck situation as they do not meet up with the road width (N.B: ANNEXURE-A). Among those bridges/culverts, 99 did not have any provision to walk on footpath which insisting pedestrian to walkthrough the main carriageway which needs immediate attention. 93 of all the structures had working guard rail/post

whereas 14 had disturbed due to previous collision with it or construction decay. Reflector was not available in any of the bridges/culverts and only 17 of them had proper pedestrian facilities. Practice of hazard sign was not found on any of the bridges/culverts.
The Audit team also found 4 railway overpasses where the traffic flow was uninterrupted. All 4 overpasses were wider than 25m and followed the RHD Road Geometric Design Manual 2005

The Audit team specifically audited the Kaliakoir Bridge and found the bridge width adequate to the road lane size, the 480m long bridge was at 1:30 slope with the existing road. The Audit team suggests both detailed design review & safety Audit (Before Construction & Post construction Audit) of bridges for proper implementation.

g. Intersections (Daudkandi to Chattogram)

A total number of 418 intersections were found on the surveyed length all of which 15 were channelized and rest were un-channelized. Of the 15 channelized intersections, 7 were skewed T-intersection and rest were at right angle. Among the un-channelized intersections 376 were at right angle. Among the junctions, 39 seemed to have steep slope on side road which needed to be treated. Corner radius was not adequate in 304 of them and, only 16 had speed change lanes. Advanced warning sign or stop sign in side road among the surveyed intersections were provided in 33 of them. Out of all intersections, 63 were not clearly visible from the main road which might cause crashes. Only 21 intersections had pedestrian facilities and 1 intersection (Ch.+ 146.44) required pedestrian facilities immediately. The audit team suggests for further details investigation on these intersections for necessary interventions.

h. Service Areas (Daudkandi to Chattogram)

The team addressed road side service areas which were situated very close to the road and their business activity creates sudden vehicle movements in or out of the road from road side area. Among the surveyed length, 78 locations were identified as commercial service area on Daudkandi-Chattogram Highway Side and 29 locations on Chattogram-Daudkandi Highway Side. and none of them had any welcome sign or speed limit sign or speed calming devices. Among these 99 of them were CNG/Petrol filling stations,4 Hotels/Resturent,2 Fire service stations, Chittagong port (Ch.+216.34), 2 factories and 1 workshop. Although, 79 of them had acceleration/

deceleration lane for vehicles. The audit team advises to create a proper guideline for Services Areas to improve vehicular movement and side road activities.

i. School Zones (Daudkandi to Chattogram)

60 school zones were marked during the survey and the number of students were approximately in between 300-1500 in each school. Though they were adjacent to the highway but none of them had any speed calming device, only 16 had warning sign and only 27 of them had pedestrian facility like zebra crossing for road crossing.

j. Builtup Areas

The team addressed roadside business areas which were unauthorized as most of them were situated very close to the road, although according to the law, there would not be any business activity within 10m of the roadside area. Among the surveyed length, 33.54km was marked as built-up area in 53 locations (N.B: ANNEXURE-A), and none of them had any welcome sign or speed calming devices. Only 10% areas had good pedestrian facilities like proper footpath. The built-up areas included Hats & Bazars of high pedestrian density. Mostly they did not have proper pedestrian facilities so the Audit team suggests detail survey with special volunteer and safety warden. The dominating structure in these areas was concrete structure. Vehicle type in these areas was mixed though bus was rapidly used mode of transport. Maximum size of built-up area was 3.72km between chainage 215Km-222km near Chattogram City.

k. Pedestrian Facilities (Daudkandi to Chattogram)

53 Pedestrian crossing facilities were found during the survey and more than 100 pedestrians/per hour were using the facilities in 32 of them (Heavy usage). 40 had pedestrian facility of footover bridge and 13 zebra crossing. Only 3 Pedestrian refuge Island were found during the survey and 27 had signs provided to encourage the use of the facilities. The audit team found the facilities nonvisible during night time because of poor lighting condition.

The Audit team specially observed the footover bridges at the entry of Bhramanbaria City and Cumilla City and found location wise ok. Capacity of footover bridges could not be assessed due to the pandemic situation.

Night Visibility (Daudkandi to Chattogram)

Overall night visibility situation was poor throughout the N1 survey section. Sufficient lighting is required on this surveyed length particularly on the built-up areas. There was no formal lighting facility provided along this road section. The built-up areas, CNG/petrol stations, hotels were found with minimal /required lighting. Signs provide on this road were not reflective at night, other than the one with visibility problem (cannot be seen at all during night), most signs had low visibility and almost no reflection capacity. In most cases, signs remained unreadable even from certain distance. Road centerline was poorly visible but faded parts on most of the road length which rendered it useless. Road edge lines were visible where given but in most part got faded or shadowed by surroundings.

Recommendations for Highway N1 (Daudkandi to Chattogram)

The audit team observed that most of the road corridor has become chaotic due to lack of highway access management that is why an overall highway access management suggestion in being given in the conclusions section. The major mitigation measures required for highway N1 is given below:

- ✓ **Immediate measures**
- It will involve restoration of 83.8 km shoulder on both sides of the Highway N1 as per standard design. Also, removal of roadside (both sides) vegetation which reducing shoulder width and obstructing visibility should be removed immediately.
- Fixation of 126 sign posts which have visibility issue and 25 signs to maintain distance from object as per design guideline. As per audit team suggestion, 728 additional signs (N.B: ANNEXURE-A) should be installed.
- Installation of only pavement markings, improvement of the 53 pedestrian facilities, strengthening enforcement, and safety campaign to local communities.
- 18 roadside hazards/ objects (N.B: ANNEXURE-A) within 2m of carriageway outer edge and roadside objects (considered 1m greater than minimum lateral clearance than mentioned as per the RHD Road Geometric Design Manual 2005) should be removed immediately.

- A total number of 418 junctions were found on the surveyed length of which 39 seemed to have steep slope (N.B: ANNEXURE-A) on side road as per Auditors view. At all junctions, approaching minor road should be aligned at a right angel to major road. Also, the intersections should be fully signed in accordance with the RHD standards. A further detailed study should be conducted on these intersections for proper treatment and smooth vehicular movement.
- Among the 182 bridges/culverts, 99 (N.B: ANNEXURE-A) did not have any provision to walk on footpath which insisting pedestrian to walk through the main carriageway. Count of pedestrian and NMV traffic would be useful in determining the seriousness of this hazard. A further investigation can be done for this hazard. If the footpath is not feasible because lack of road side width, an attempt should be made to encourage vehicles to slow down using signs, markings and warning driver by rumble strips as per details investigations.
- Of the 60 school zones close to the highway, all require speed management, 44 require warning sign and 33 require pedestrian facility like zebra crossing/foot over bridge with proper feasibility studies.

Immediate measures should be taken within a year (based on detail investigation comprising of traffic survey, topographic survey and community feedback for pedestrian crossings).

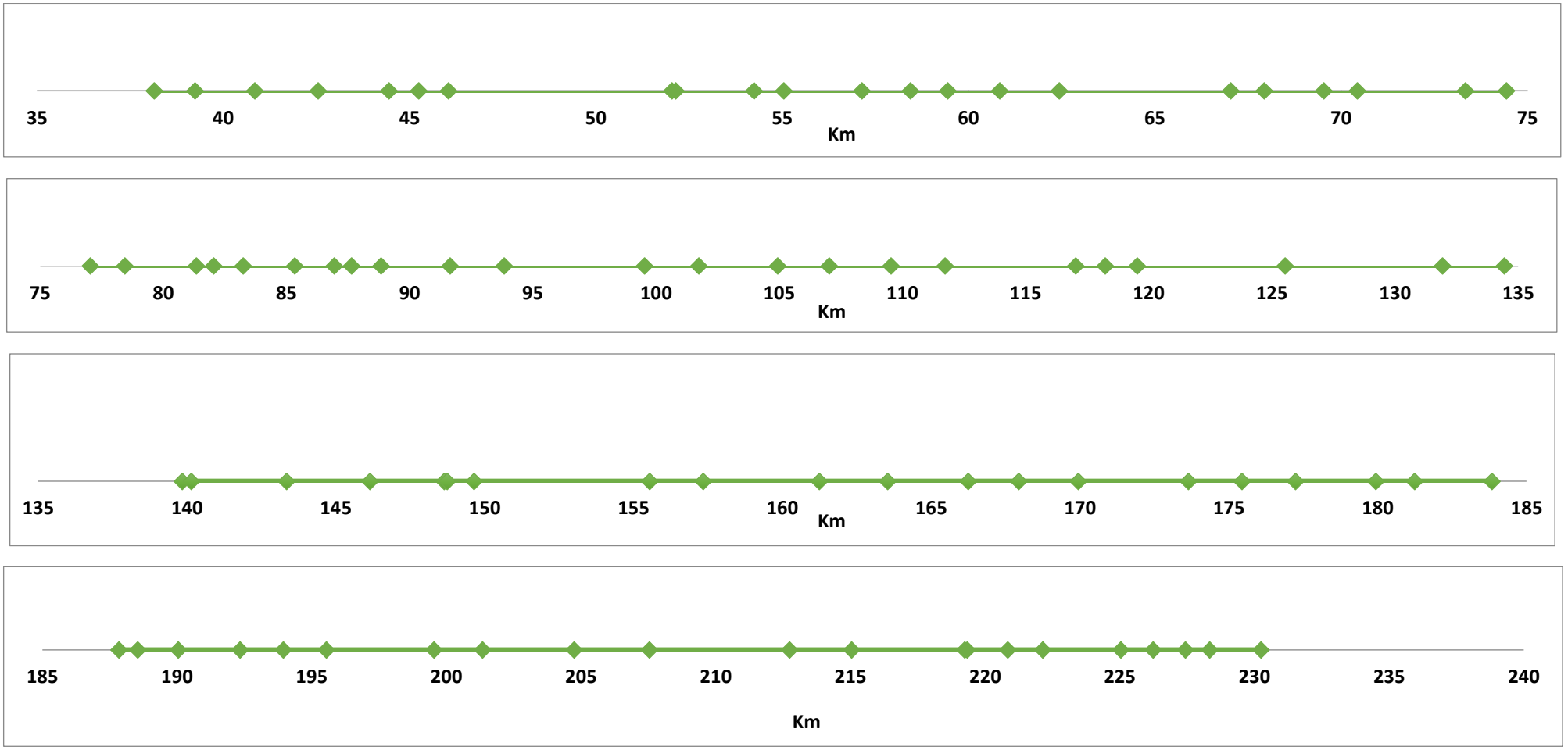


Figure 5.5: Meadian Openings on Daudkandi to Chattogram(N1)

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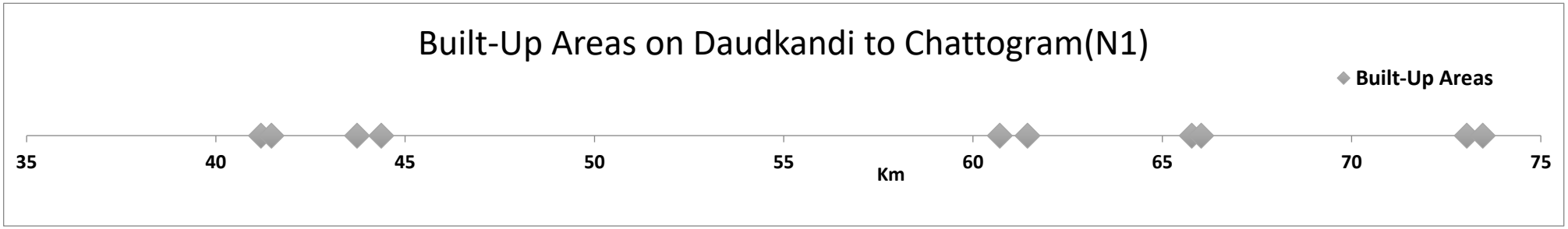

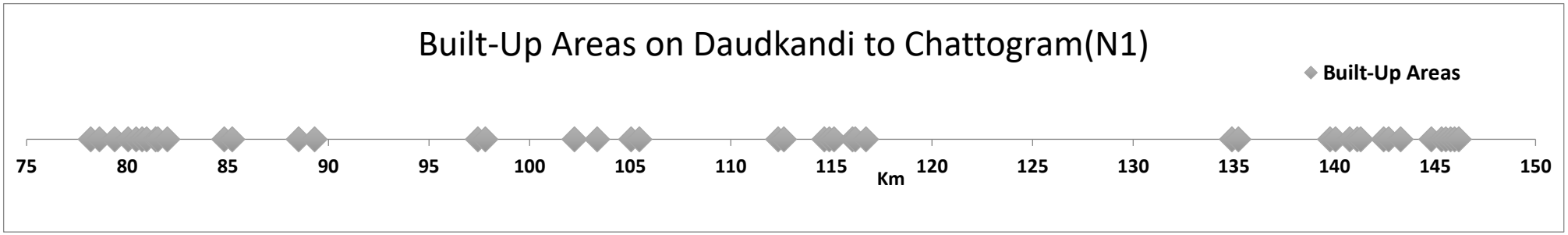

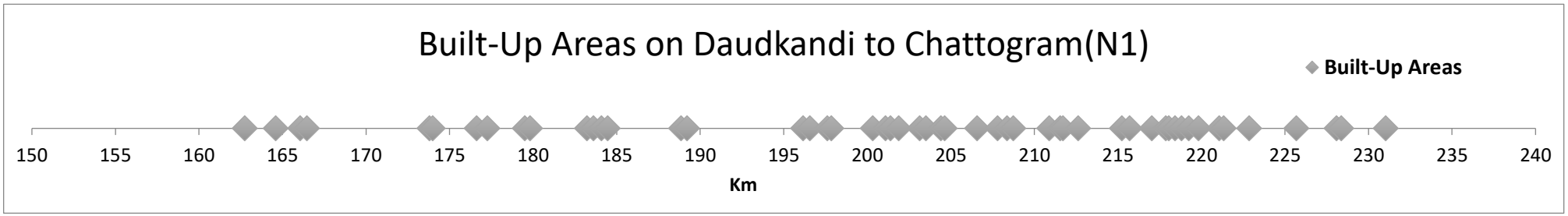

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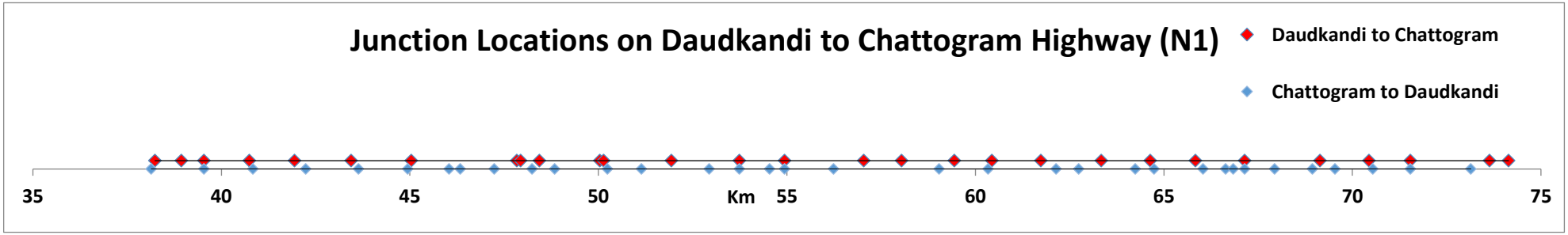
Figure 5.6: Location of Built-Up Areas on Daudkandi to Chattogram(N1)



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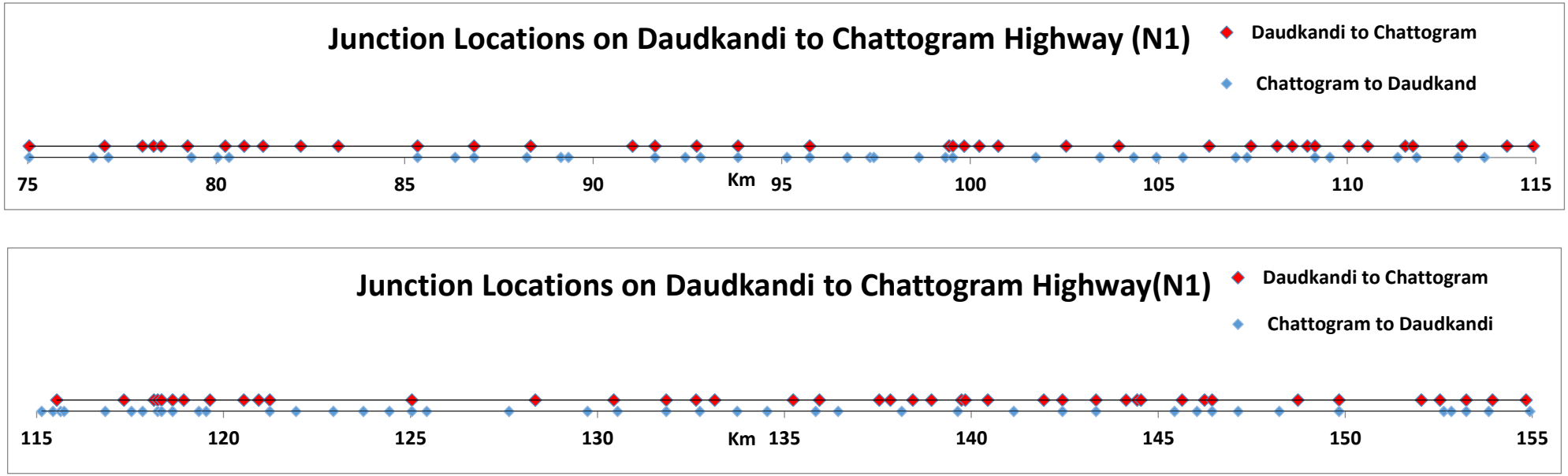

Figure 5.7a: Junction Locations on Daudkandi to Chattogram Highway (N1)

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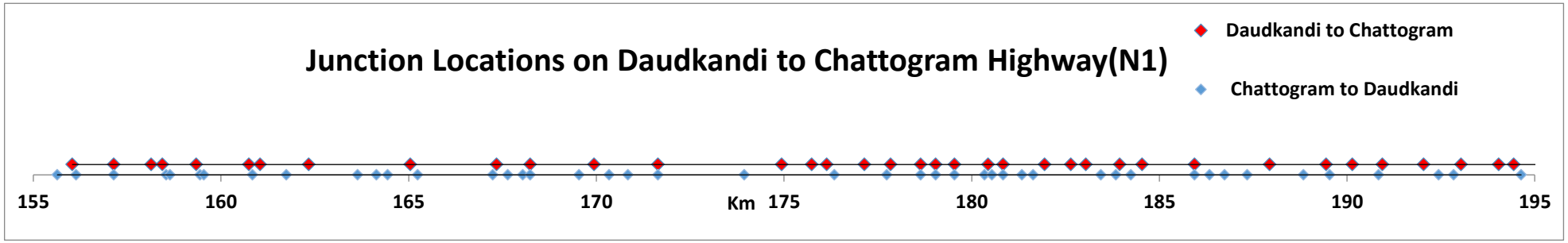

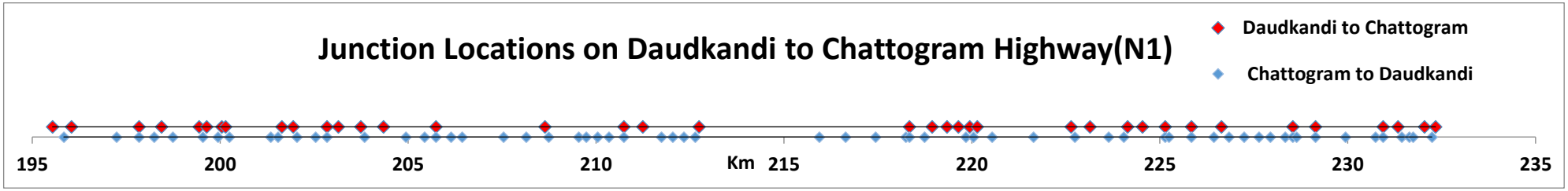

Figure5.7b: Junction Locations on Daudkandi to Chattogram Highway (N1)

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Unauthorized road side activity within Ch.+ 121 to Ch.+140

Disturbed Shoulder and sign within Ch.+53 to Ch.+54

Risky edge drop and structure within Ch.+53 to Ch.+54

Disturbed road sign visibility issue within Ch.+55 to Ch.+56

N1(Daudkandi-Chattogram)

HeptaTech Limited Dhaka

Poor visibility of road signs within Ch.+59 to Ch.+60

Unauthorized road side activity within Ch.+ 59 to Ch.+60

waterlogged shoulder within Ch.+ 74 to Ch.+78

Disturbed road sign at Ch.+ 85 to Ch.+88

N1(Daudkandi-Chattogram)

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Disturbed road sign at Ch.+88 to Ch.+92

Unauthorized road side business within clear zone at Ch.+ 92 to Ch.+96

Road side bush occupying earthen shoulder at Ch.+ 98 to Ch.+101

Risky high edge at Ch.+102 to Ch.+106

N1(Daudkandi-Chattogram)

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Illegal usage of bus stand within Ch.+106 to Ch.+110

Inadequate shoulder within Ch.+110 to Ch.+112

Less visible road sign at Ch.+141 to Ch.+144

Risky pedestrian standing on meadin at Ch.+ 110 to Ch.+116

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Risky shoulder edge at Ch.+103 to Ch.+106

Less visible road sign at Ch.+148 to Ch.+156

Illegal stoppage of vehicle at Ch.+129 to Ch.+131

Road side occupancy in shoulder within Ch.+160 to Ch.+166

N1(Daudkandi-Chattogram)

HeptaTech Limited Dhaka

CHAPTER 5
RESULTS (N1)

Urban Road Section Audit Findings (Dhaka to Kanchpur)

For detail information Dhaka to Kanchpur (N1) highway, check ANNEXURE-C and ANNEXURE-D.

l. Road Side Hazards (Dhaka to Kanchpur)

- Road side hazards are those temporary /permanent structures along the road which may increase crash severity if hit by vehicle. Audit team considered 2m width after the pavement and counted permanent/ temporary structures, trees (diameter more than 6cm) and steel poles.
- Roadside clear zone occupied by temporary structure 0.1km (1.25%) on left side whereas no permanent structures (mainly concrete structures) occupied roadside length during journey from Dhaka to Kanchpur. From Dhaka to Kanchpur, temporary structures occupied 0.1km (1.25%) whereas permanent structures (mainly concrete structures) occupied around 0.5km (6.25%) roadside length.
- Combining both sides, surveyed road of Dhaka to Kanchpur(N1) consisted only 2 temporary structures and 5 permanent structures within 2m from hard shoulder edge.
- Immediate measure required chainages of roadside hazards are given in ANNEXURE-A.

m. Signs (Dhaka to Kanchpur)

- In most cases, Necessary regulatory, warning and information signs were not in place. Existing signs were not quite conspicuous and clear. In some cases, no regulatory, warning or information signs was placed. Sometimes non-conventional signs were placed at the center of carriageway without any engineered treatment
- A total of 35 signs were found in both sides of the highway which were mainly U-turn, C21,B3, B7, C22,C28 etc.

- Some of the existing signs were not visible due to road side activities such as roadside shops, billboards on street parking, temporary gate installed on the road etc. Some signs were not at all visible due to vegetation and some were not visible from a distance due to vegetation. Some signs were ineffective and illegible due to faded color in the background, letters, signs and borders. Team observed 3 signs(N.B: ANNEXURE-A) having such problems.
- According to BRTA manual, for an 80km speed highway, the sign should be placed 150m far from object which was not seen in most of the cases along the road length. Team found a total of 3 signs (N.B: ANNEXURE-A) which were very close from the hazard and very hard to understand by moving traffic.
- Audit team suggested to put additional 39 signs along the highway which are required but missing and mandatory to make the road safer which are mainly C21, B3,C4, Filling Station etc. A list of additionally required signs suggested by audit team has been given on ANNEXURE-A.
- The team explored total number of 39 signs that needs to be prepared/ installed.

n. Pavement Stature (Dhaka to Kanchpur)

- On Dhaka to Kanchpur Highway Side, the pavement of surveyed 8km was mostly satisfactory. On Kanchpur to Dhaka Highway side, 6.8km (85%) of the pavement out of 8 km was satisfactory whereas 1.2km (15%) had potholes (N.B: ANNEXURE-A).

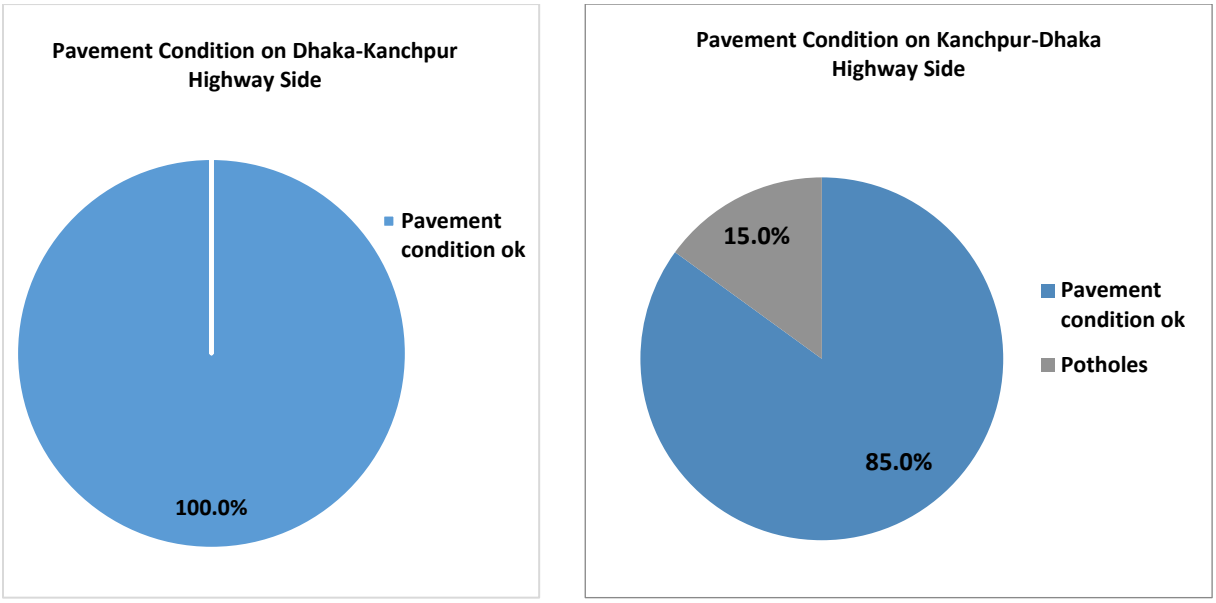

Figure 5.8: Pavement Condition on Dhaka-Kanchpur Highway (N1)(both sides)

- The roadway had no curved location on both sides of surveyed 8km of Dhaka-Kanchpur Highway.
- Almost 3.8km on left side of Dhaka-Kanchpur Highway had inadequate hard shoulder width (less than 1.5m) which did not meet RHD standard though rest 4.2 shoulder was properly maintained. On the right side of Dhaka-Kanchpur Highway, 3.6km had inadequate hard shoulder and rest section was found appropriate as per design standard.
- Overall Centerline road marking was visible but needs maintenance as they were being faded and edge lines got faded on most of the road length.
- Median was available throughout the 8.00km part of the highway section and was as per standard although median color is faded and surface not retro-reflective which can cause unwanted collisions.

o. Parking Facilities (Dhaka to Kanchpur)

Survey team found 38 locations on Dhaka to Kanchpur Highway Side and 40 locations on Kanchpur to Dhaka Highway Side where road was being occupied by illegal road side parking which indicates the necessity of formal parking facility along the road way. No formal parking was found on Dhaka-Kanchpur Highway.

p. Bus Stand (Dhaka to Kanchpur)

The surveyed length had 17 bus stand facilities,9 of them on Dhaka-Kanchpur Highway Side and 8 on Kanchpur-Dhaka Highway Side. 4 of them were too close to an intersection

(within 50m), 8 of them had no Bus Stop sign available,none of them had proper busbay facilities, 14 of them had pedestrian crossing facilities nearby to access the busstop, none of them had acceleration/deceleration lane for vehicles and neither had proper lighting facilities.

q. Bridges/Culverts (Dhaka to Kanchpur)

The survey team found only 2 culverts (Chaiagre+0.80Km & +2.10Km) in this surveyed road section of 8.00Km. Between those culverts, none of them have any provision to walk on footpath which insisting pedestrian to walkthrough the main carriageway which needs attention. Both of all the structures had guard rail/post but disturbed due to previous collision with it or construction decay. Reflector was not available in any of the culverts nor any proper pedestrian facilities. Practice of hazard sign was not found on any of the culverts.

r. Intersections (Dhaka to Kanchpur)

A total number of 48 intersections were found on the surveyed length all of un-channelized. Of all the un-channelized intersections 45 were at right angle. Among the junctions, 44 seemed to have steep slope in side roads which needed to be treated. Corner radius was not adequate in 45 of them and only 1 had speed change lane. Advanced warning sign or stop sign in side road among the surveyed intersections were not provided in any of them. Out of all intersections, 43 were not clearly visible from the main road which might cause crashes. Only 5 intersections had pedestrian facilities. The audit team suggests for further details investigation on these intersections for necessary interventions.

s. Service Areas (Dhaka to Kanchpur)

The team investigated road side service areas which were situated very close to the road and their business activity creates sudden vehicle movements in or out of the road from road side area. Among the surveyed length,11 locations were identified as commercial service area on Dhaka-Kanchpur Highway side and 8 locations on Kanchpur-Dhaka Highway side. 14 of them had welcome sign or speed limit sign or speed calming devices. All these were CNG/Petrol filling stations. Although, 13 of them had acceleration/ deceleration lane for vehicles. The audit team advices to create a

proper guideline for Services Areas to improve vehicular movement and side road activities.

t. School Zones (Dhaka to Kanchpur)

7 school zones were observed during the survey and the number of students were approximately in between 300-1000 in each school. Though they were adjacent to the highway but only 1 of them had speed calming device, only 6 had warning sign and only 5 had pedestrian facility like zebra crossing.

u. Pedestrian Facilities (Dhaka to Kanchpur)

12 Pedestrian overpass were found during the survey and more than 100 pedestrians were using the facilities in 11 of them (Heavy usage). All 12 were Footover Bridge. 5 had signs provided to encourage the use of the facilities. The audit team found the facilities non visible during night time because of poor lighting condition.

v. Night Visibility (Dhaka to Kanchpur)

Overall night visibility situation was poor throughout the N1 survey section. Sufficient lighting is required on this surveyed length particularly on built-up areas. There was no formal lighting facility provided along this road section. The built-up areas, CNG/petrol stations, hotels were found with minimal /required lighting. Signs were not reflective at night, other than the one with visibility problem (cannot be seen at all during night), most signs had low visibility and almost no reflection capacity. In most cases, signs remained unreadable even from certain distance. Road centerline was visible but faded parts on most of the road length rendered it useless. Road edge lines were visible where given but in most part got faded or shadowed by surroundings.

Recommendations for Highway N1 (Dhaka to Kanchpur)

The audit team observed that most of the road corridor has become chaotic due to lack of highway access management that is why an overall highway access management suggestion has been given in the conclusions section. The major mitigation measures required for highway N1 (Dhaka to Kanchpur) is given below:

✓ **Immediate measures**

- It will involve restoration of 7.4 km shoulder on both sides of the Highway N1 as per standard design. Also, removal of roadside (both sides) vegetation which

reducing shoulder width and obstructing visibility should be removed immediately.

- Fixation of 3 sign posts which have visibility issue and 3 signs to maintain distance from object as per design guideline. As per audit team suggestion, 45 additional signs (N.B: ANNEXURE-A).should be installed.
- Installation of only pavement markings, improvement of the 7 pedestrian facilities, strengthening enforcement, and safety campaign to local communities.
- 7 roadside hazards/ objects (N.B: ANNEXURE-A within 2m of carriageway outer edge and roadside objects (considered 1m greater than minimum lateral clearance than mentioned as per the RHD Road Geometric Design Manual 2005) should be removed immediately.
- A total number of 48 junctions were found on the surveyed length of which 4 seemed to have mild slope on side road as per Auditors view. At all junctions, approaching minor road should be aligned at a right angel to major road. Also, the intersections should be fully signed in accordance with the RHD standards. A further detailed study should be conducted on these intersections for proper treatment and smooth vehicular movement.
- Among the 2 culverts (Chaiagre+0.80Km & +2.10Km), both did not have any provision to walk on footpath which insisting pedestrian to walk through the main carriageway that needed immediate attention as per required design. Count of pedestrian and NMV traffic would be useful in determining the seriousness of this hazard. If the footpath is not feasible, an attempt should be made to encourage vehicles to slow down using signs, markings and warning driver by rumble strips.
- Of the 7 school zones close to the highway, 6 require speed management, 1 required warning sign and 2 pedestrian facilities like zebra crossing/foot over bridge.

Immediate measures should be taken within a year (based on detail investigation comprising of traffic survey, topographic survey and community feedback for pedestrian crossings).

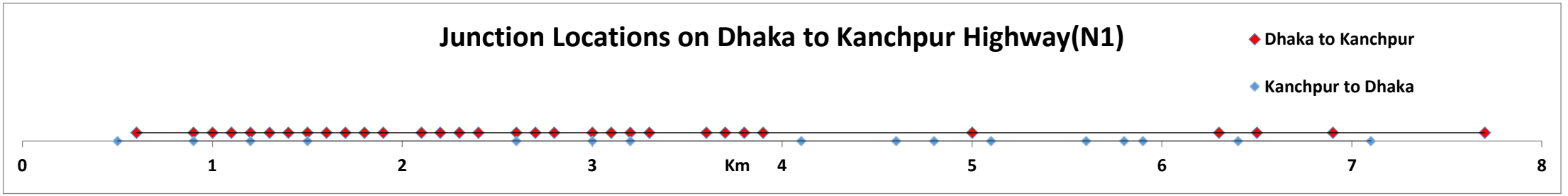

Figure 5.9: Junction Locations on Dhaka to Kanchpur Highway (N1)

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Unauthorized road side activity within Ch.+ 2 to Ch.+4

Disturbed Shoulder and sign within Ch.+ 2 to Ch.+4

Risky edge structure within Ch.+ 2 to Ch.+4

Disturbed road sign within Ch.+ 2 to Ch.+4

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Poor visibility of road signs within Ch.+52 to Ch.+4

Unauthorized road side activity within Ch.+ 4 to Ch.+5

waterlogged shoulder within Ch.+ 4 to Ch.+5

Unauthorized parking on side road at Ch.+ 5 to Ch.+6

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Unauthorized road side disposal unit at Ch.+5 to Ch.+6

Unauthorized parking at Ch.+ 5 to Ch.+6

Unauthorized parking forcing pedestrians on road at Ch.+ 5 to Ch.+6

Risky median with no reflectivity at Ch.+ 5 to Ch.+6

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CHAPTER 5

RESULTS (N3)

Banani - Airport Highway (N3)

Surveyed length: 6.00 Km on both sides of the road

Salient Features of the Study Segment of N3

The N3 connects the capital Dhaka with Mymensingh. The highway has been considered as one of the major transport hazards, a man-made death traps owing to the frequency of fatal crashes. The road safety audit was conducted from 5 October to 7 October 2020 on this highway road. The road mainly is a 4 lane highway with average width of 8m to 9m with partial NMT sections. The road had a standard shoulder of 1.5 m.

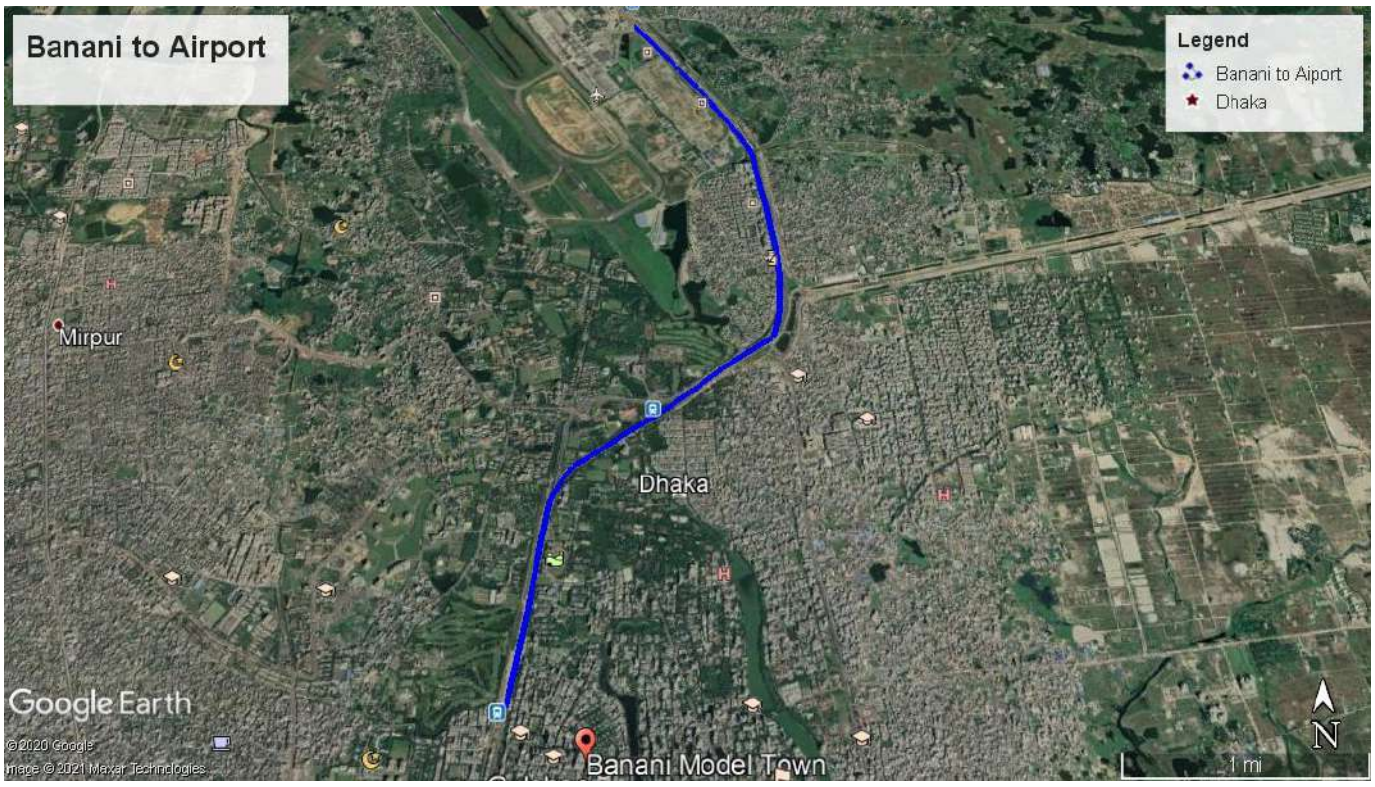

Figure 5.10: Road Section of Banani-Airport Highway (N3) [Source: Google Earth]

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Traffic Data

N3 is one of the busiest roads in the country and a top development priority. The AADT (Average Annual Daily Traffic) of this road is 13583 (Motorized: 13129 , Non-Motorized: 454).

Road Traffic Injury and Crash Data

Police reported Injury and crash statistics (2011-2015) [Source: ARI-BUET] based on statistical analysis shows that since 2011, about 30 crashes were responsible for about 30fatalities on this highway section of 6km. So, almost 5 fatality occurs in each 1km of the surveyed section. The most dominant crash type on this section was hit pedestrian (50%), rear end collision (17%) and others consisted the rest 33%. Geometrical feature, overtaking tendency on this mostly single carriageway highway is the prime cause of high head on collision percentage. The geometrical crash study indicated that 97% crashes took place in the straight sections of the highway compared to only 6% on curves, which referred to the high speed and reckless driving as major concerns for treatment of the highway

Injury and crash statistics (2016-2019) based on newspaper reported statistics [ANNEX-F] shows that 124 accidents took place in Banani-Gazipur Section causing 133 fatalities. . The most dominant types crash on this section were hit pedestrian (56%), rear end collision (27%) and others consisted the rest 17%. In Banani-Gazipur Section most accidents took place in Tongi and Airport road.

Urban Road Section Audit Findings (Banani-Airport)

For detail information on Banani to Airport (N3), check ANNEXURE-C and ANNEXURE-D

w. Road Side Hazards (Banani to Airport)

- Road side hazards are those temporary /permanent structures along the road which may increase crash severity if hit by vehicle. Audit team considered 2m width after the pavement and counted permanent/ temporary structures, trees (diameter more than 6cm) and steel poles.

- Roadside clear zone occupied by temporary structure 0..9km (15%) on left side whereas no permanent structures (mainly concrete structures) occupied roadside length during journey from Banani to Airport. From i Airport to Banani, temporary structures occupied 0.1km (1.27%) whereas no permanent structures (mainly concrete structures).
- Combining both sides, surveyed road of no permanent structures (N3) consisted only 10 temporary structures and no permanent structures within 2m from hard shoulder edge.
- Immediate measure required chainages of roadside hazards are given in ANNEXURE-A.

x. Signs (Banani to Airport)

- In most cases, necessary regulatory, warning and information signs were not in place. Existing signs were not quite conspicuous and clear. In some cases, no regulatory, warning or information signs was placed. Sometimes non-conventional signs were placed at the center of carriageway without any engineered treatment
- A total of 38 signs were found in both sides of the highway which were mainly U-turn, C21,B3, C28 etc.
- Some of the existing signs were not visible due to road side activities such as roadside shops, billboards on street parking, temporary gate installed on the road etc. Some signs were not at all visible due to vegetation and some were not visible from a distance due to vegetation. Some signs were ineffective and illegible due to faded color in the background, letters, signs and borders. Team observed 2 signs (N.B: ANNEXURE-A) having such problems.
- According to BRTA manual, for an 80km speed highway, the sign should be placed 150m far from object which was not seen in most of the cases along the road length. Team found no signs which were very close from the hazard or very hard to understand by moving traffic.
- Audit team suggested to put additional 23 signs along the highway which are required but missing and mandatory to make the road safer which are

mainly C21, B3,B7, Filling Station etc. A list of additionally required signs suggested by audit team has been given on ANNEXURE-A.

- The team explored total number of 25 signs that needs to be prepared/ installed.

y. Pavement Stature (Banani to Airport)

- On Banani to Airport Highway side, the pavement of surveyed 6km was mostly satisfactory. On Airport to Banani Highway Side 5.8km (96.67%) of the pavement of 8 km was mostly satisfactory whereas 0.2km (3.33%) out of 6km was distressed.

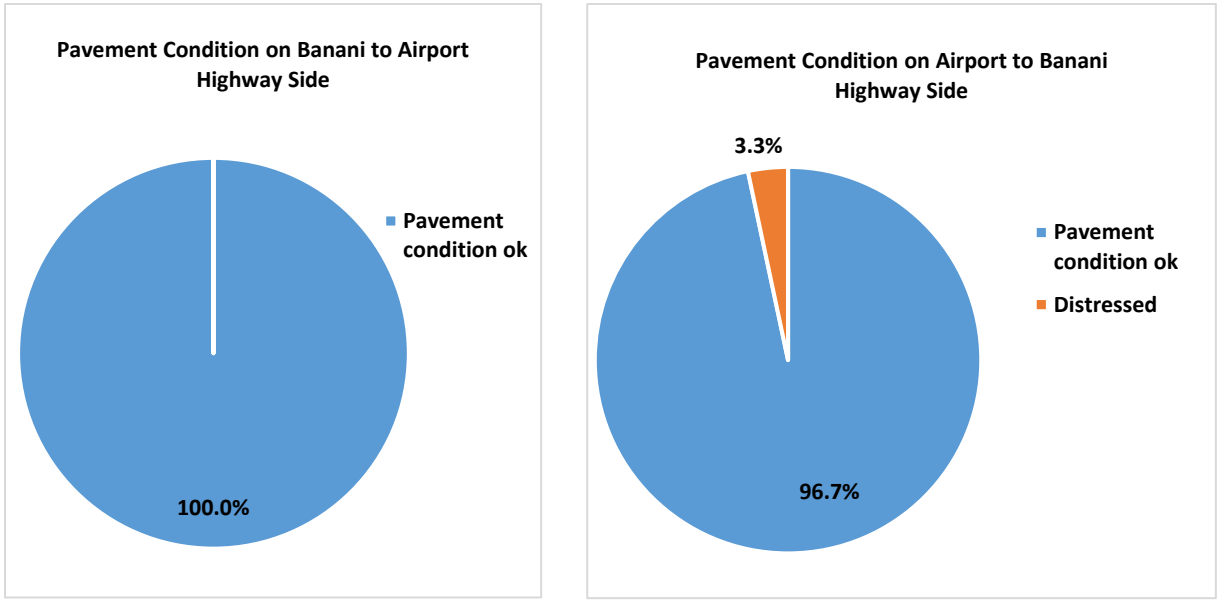

Figure 5.11: Pavement Condition on Banani to Airport Highway (N3)(both sides)

- The roadway had no sharp curve location on both sides of surveyed 6km of Banani-Airport Highway.
- Almost 5.6km on left side of Banani-Airport Highway had inadequate hard shoulder width (less than 1.5m) which did not meet RHD. On the right side of Banani-Airport Highway, 4.7km had inadequate hard shoulder and rest section was found appropriate as per design standard.
- Overall Centerline road marking was visible but needs maintenance as they were being faded and edge lines got faded on most of the road length.
- Median was available throughout the 6.00km part of the highway section and was as per standard although median color is faded and surface not retro-reflective which can cause unwanted collisions.

z. Parking Facilities (Banani to Airport)

Survey team found 14 locations on Banani to Airport Highway Side and 9 locations on Airport to Banani Highway Side where road was being occupied by illegal road side parking which indicates the necessity of formal parking facility along the road way. 4 formal parking were found on Banani to Airport Highway.

aa. Bus Stand (Banani to Airport)

The surveyed length had 9 bus stand facilities,4 of them on Banani-Airport Highway Side and 5 on Airport-Banani Highway Side. 2 of them were too close to an intersection (within 50m), 4 of them had no Bus Stop sign available,none of them had proper busbay facilities, all of them had pedestrian crossing facilities nearby to access the busstop, 4 of them had acceleration/deceleration lane for vehicles and only 2 had proper lighting facilities.

bb.Intersections (Banani to Airport)

A total number of 26 intersections were found on the surveyed length all but 1 of them was un-channelized. Of all the un-channelized intersections 14 were at right angle. Among the junctions, none seemed to have steep slope on side road. Corner radius was not adequate in 3 of them and, only 3 had speed change lane. Advanced warning sign or stop sign in side road among the surveyed intersections were not provided in 3 of them. Out of all intersections, 2 were not clearly visible from the main road which might cause crashes. Only12 intersections had pedestrian facilities. The audit team suggests for further details investigation on these intersections for necessary interventions.

cc. Service Areas (Banani to Airport)

The team addressed road side service areas which were situated very close to the road and their business activity creates sudden vehicle movements in or out of the road from road side area. Among the surveyed length,10 locations were identified as commercial service area on Banani-Airport Highway side and 6 locations on Airport-Banani Highway side. 9 of them had any welcome sign or speed limit sign or speed calming devices. Although, 7 of them had acceleration/ deceleration lane for vehicles. The audit team advises to prepare a proper guideline for Service Areas to improve vehicular movement and side road activities.

dd.Pedestrian Facilities (Banani to Airport)

8 Pedestrian crossing facilities were found during the survey and more than 100 pedestrians/per hour were using the facilities in 7 of them (Heavy usage). Among them, 7 were pedestrian facility of Footover Bridge and 1 was zebra crossing. Only 1 Pedestrian Island was found during the survey and 1 had sign provided to encourage the use of the facility. The audit team found the facilities non visible during night time because of poor lighting condition. The audit team observed high pedestrian concentration during morning and evening, even pedestrians walking on highway roads which indicate lack of proper footpath facilities. The audit team found footpath facilities on Banani to Nikunju section only.

ee. Night Visibility (Banani to Airport)

Overall night visibility situation was moderate throughout the N3 survey section. Sufficient lighting is required on this surveyed length. There was minimal formal lighting facility provided along this road section. The built-up areas, CNG/petrol stations, hotels were found with required lighting. Signs were not reflective at night, other than the one with visibility problem (cannot be seen at all during night), most signs had low visibility and almost no reflection capacity. In most cases, signs remained unreadable even from certain distance. Road centerline was visible but faded parts on most of the road length rendered it useless. Road edge lines were visible where given but in most part got faded or shadowed by surroundings.

Recommendations for Highway N3 (Banani to Airport)

The audit team observed that most of the road corridor has become chaotic due to lack of highway access management that is why an overall highway access management suggestion in being given in the conclusions section. The major mitigation measures required for highway N3 (Banani to Airport) is given below:

- ✓ **Immediate measures**
- It will involve restoration of 10.3 km shoulder on both sides of the Highway N3 as per standard design.
- Fixation of 2 sign posts which have visibility issue as per design guideline. As per audit team suggestion, 25 additional signs (N.B: ANNEXURE-A) should be installed.

- Installation of pavement markings, improvement of the 7 pedestrian facilities, strengthening enforcement, and safety campaign to local communities.
- 10 roadside hazards/ objects (N.B: ANNEXURE-A) within 2m of carriageway outer edge and roadside objects (considered 1m greater than minimum lateral clearance than mentioned as per the RHD Road Geometric Design Manual 2005) should be removed immediately.
- A total number of 26 junctions were found on the surveyed length. At all junctions, approaching minor road should be aligned at a right angel to major road. Also, the intersections should be fully signed in accordance with the RHD standards. A further detailed study should be conducted on these intersections for proper treatment and smooth vehicular movement.

Immediate measures should be taken within a year (based on detail investigation comprising of traffic survey, topographic survey and community feedback for pedestrian crossings).

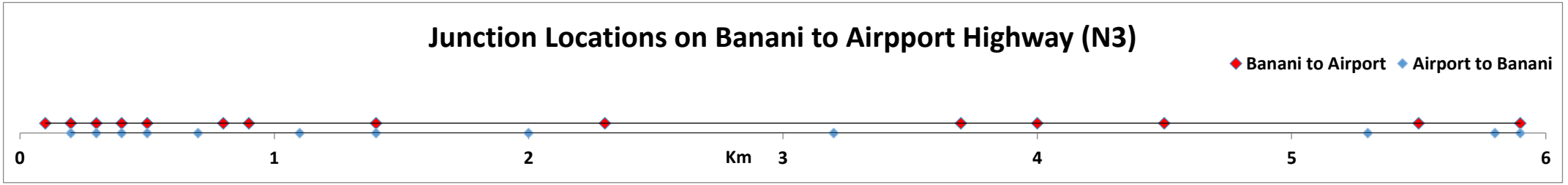

Figure 5.12: Junction Locations on Banani to Airpport Highway(N3)

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Poor visibility of signage at Kurmitola Hospital

Poor condition of divider near Uttara

Mess

Abrupt ending of sidewalk at a very risky zone in front of Radisson

Disturebed sign at under flyover

N3(Banani-Airport)

RESULT

Airport to Joyedvpur Highway (N3) & Joydevpur-Tangail-Elenga (N4)

Surveyed length: 90.0 km underconstruction road

Salient Features of the Study Segment

The **Joyedvpur Highway (N3) & Joydevpur-Tangail-Elenga(N4)** Highway plays a vital role in interregional road transportation in Bangladesh. This highway is becoming one of the main artery of transportation in Bangladesh. The Road Safety Audit was conducted from 5 November to 14 November 2020 on this highway road. The road mainly is a 2 lane highway, due to demand, this road is being expanded to a 4 lane highway.

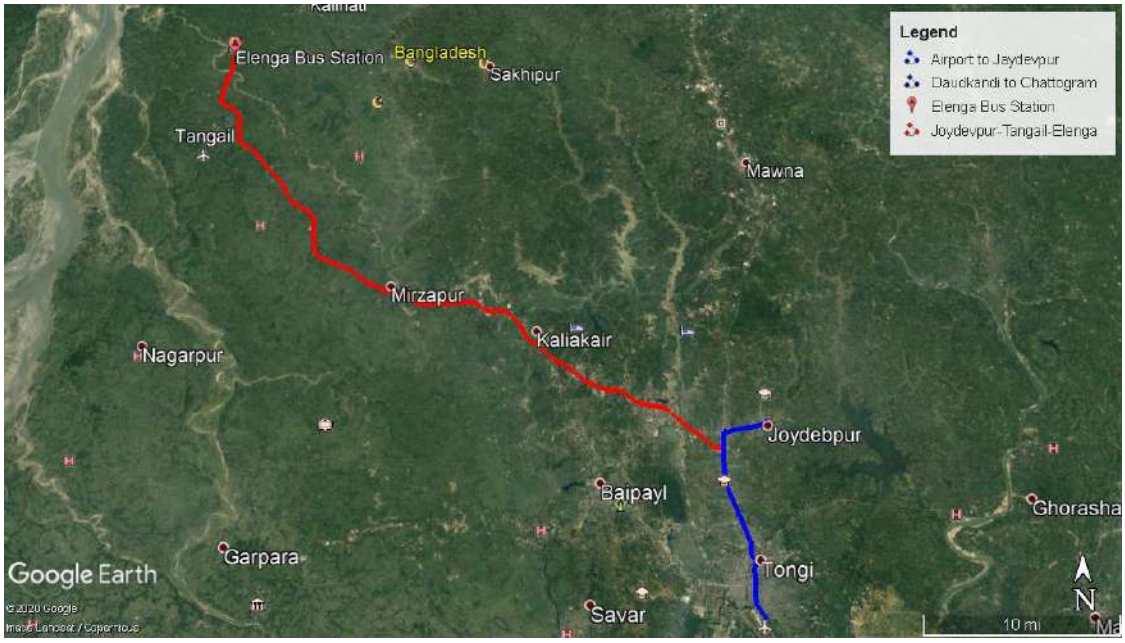

Figure 5.13: Under construction road Section of Joyedvpur Highway (N3) & Joydevpur-Tangail-Elenga(N4) [Source: Google Earth]

Audit Findings

SAFETY AUDIT FOR CONSTRUCTION ZONE

a. **Background:** Safety Audit for the construction zone of national highways is a new laudable effort by RHD which is critical for ensuring a trouble free and safe

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movement of vehicle and pedestrian passing through the construction zone. It is a new and laudable effort from RHD. This audit is of special nature compared to audit of completed roads. It focuses mostly on traffic management, safety of construction workers, safe movement of construction vehicle, visibility of construction zone and regular monitoring of safety issues within the construction zone. Considering the above issues a new detail checklist has been prepared by the consultant (based on international best practice) and was used for collecting information from the field. In addition to the checklist the consultant has reviewed the contract document but did not find any road safety related drawings for work zone. There was no separate pay item for traffic management in the Bill of Quantity (BoQ).

b. Field Investigation : The information collected are summarized in tables below: (Details given on ANNEXURE-C). The checklist for construction zone audit has been developed based on MANUAL ON ROAD SAFETY AUDIT by INDIAN ROAD CONGRESS- 201O.

Table 5.1: Compliance of Safety Audit In Construction Zone

(Airport To Joydevpur -28 Locations)

Sl No	Item of audit	Status during field investigation	Compliance (%)
1	Separation of construction zone	Y 15. N-11, NA-1 , P-1	56
2	Working zone identifiable from distance	Y- 24, N- 3 , NA-1, P-0	89
3	Facilities for safe entry/exit of construction vehicle and equipment	Y -3. N- 19, NA-6 , P-0	14
4	Advance warning signs and markings	Y- 1, N- 26 , NA-1, P-0	4
5	Construction vehicles guided by traffic control devices	Y -0. N- 26, NA-2 , P-0	0
6	Temporary traffic control measures by signals or wardens	Y- 17, N- 11 , NA-0, P-0	61
7	Diversion roads identifiable from distance	Y -2. N- 19, NA-7 , P-0	10
8	Facilities for diverted vehicles to diversion road a. pavement condition of the temporary road b. proper traffic control devices installed c. sufficient width of road	Y- 1, N-3 , NA-24 P-0 Y- 0, N-4, NA-25, P-1 Y- 8. N-.4, NA- 25, P-0	25 0 0
9	Difficulty to road user to adjust to the new situation	Y -12.N- 15, NA-0 , P-1	46
10	Confusion to the drivers to select through route	Y- 12, N- 16 , NA-0, P-0	57

Sl No	Item of audit	Status during field investigation	Compliance (%)
11	Confusion to drivers between temporary and permanent signal	Y -0. N-16, NA-12 ,P-0	100
12	Temporary signs get priority over permanent signs	Y- 0,N- 5 ,NA-23, P-0	0
13	Speed control devices installed approaching construction zone	Y-1, N-27,NA-0, P-0	4
14	Proper facilities for the pedestrians	Y- 2,N-2 6,NA-0, P-0	7
15	Whether police or emergency service consulted	Y21,N- 2,NA-5 ,P-0	91
16	Availability of Flagman at site	Y- 7,N-20, NA-1,P-0	26
17	Construction workers provided with safety jackets	Y-20,N- 4, NA-4, P-0	69
18	Width of lanes satisfactory for vehicles passing through the working zones	Y-1, N-21 , NA-6, P-0	5
19	Availability of first aid box and emergency care	Y -5, N-18, NA-5 P-0	22
20	Regular monitoring by the supervision consultant	Y- 13, N- 15 ,NA-0, P-0	46
21	Road safety campaigns to workers and neighborhood population	Y -3. N- 25, NA-0 , P-0	10
22	Problem to relocate the bus stop	Y- 0, N- 4 , NA-24 ,P-0	100
23	Identification of construction zone during night	Y -2 N- 27, NA-1 P-0	0
24	Proper lighting facilities in construction zone	Y- 0, N- 27 , NA-1, P-0	0
25	Exit/entry facility for construction equipment and vehicle during night	Y- 0, N- 27 , NA-1, P-0	0
AVERAGE COMPLIANCE			**30.00%**

- **Y-Yes, N- No, NA –Not Applicable P- Partially**

Table 5.2: Compliance Of Safety Audit In Construction Zone

(Vogra To Elenga At 13 Locations)

Sl No	Item of audit	Status during field investigation	Compliance (%)
1	Separation of construction zone	Y -6, N- 5, NA- , P-2	46
2	Working zone identifiable from distance	Y- 10, N- 3 , NA-0, P-0	77
3	Facilities for safe entry/exit of construction vehicle and equipment	Y -1. N- 10, NA-O , P-2	23

Sl No	Item of audit	Status during field investigation	Compliance (%)
4	Advance warning signs and markings	Y- 5, N- 8 , NA-0, P-0	39
5	Construction vehicles guided by traffic control devices	Y -4,N- 5, NA-0 , P-4	46
6	Temporary traffic control measures by signals or wardens	Y- 4, N- 9 , NA-0, P-0	31
7	Diversion roads identifiable from distance	Y -7, N- 2, NA-0 , P-4	69
8	Facilities for diverted vehicles to diversion road a. pavement condition of the temporary road b. proper traffic control devices installed c. sufficient width of road	Y- 10, N- 2 , NA-1, P-0 Y- 2, N-9, NA- 1, P-1 Y- 8. N-.5, NA-0, P-0	83 25 62
9	Difficulty to road user to adjust to the new situation	Y -10.N- 2, NA-1 , P-0	83
10	Confusion to the drivers to select through route	Y- 7, N- 6 , NA-0, P-0	54
11	Confusion to drivers between temporary and permanent signal	Y -1. N- 5, NA-7 , P-2	17
12	Temporary signs get priority over permanent signs	Y- 1, N- 13 , NA-11, P-0	50
13	Speed control devices installed approaching construction zone	Y -0, N- 13,NA-0, P-0	0
14	Proper facilities for the pedestrians	Y- 3, N- 7 , NA-2, P-1	31
15	Whether police or emergency service consulted	Y- 13,N- 0, NA-0 , P-0	100
16	Availability of Flagman at site	Y- 3, N- 9 , NA-0, P-1	31
17	Construction workers provided with safety jackets	Y -7. N- 2, NA-0 , P-4	69
18	Width of lanes satisfactory for vehicles passing through the working zones	Y- 7, N- 6 , NA-0, P-0	54
19	Availability of first aid box and emergency care	Y -1, N-12, NA-0 , P-0	8
20	Regular monitoring by the supervision consultant	Y- 13, N- 0 , NA-0, P-0	100
21	Road safety campaigns to workers and neighborhood population	Y -0. N- 13, NA-0 , P-2	0
22	Problem to relocate the bus stop	Y- 0, N- 0 , NA-13 , P-0	-
23	Identification of construction zone during night	Y -2 N- 11, NA-0 , P-0	15

Sl No	Item of audit	Status during field investigation	Compliance (%)
24	Proper lighting facilities in construction zone	Y- 0, N- 13 , NA-0, P-0	0
25	Exit/entry facility for construction equipment and vehicle during night	Y- 0, N- 13 , NA-0, P-0	0
AVERAGE COMPLIANCE			**43.00%**

- **Y-Yes, N- No, NA –Not Applicable P- Partially**

c. Summary of Findings:

Airport to Joydevepur Section: The construction zones were scattered. Too many working zones were created) 28 locations within a length of 20km) This created confusion and trouble for the passing vehicles and pedestrians. The compliance of audit is 30% only which is much below than the desired level. The critical issues are described below:

- Lack of diversion roads
- Inadequate facility for pedestrian
- Confusion to drivers over temporary and permanent sign
- Absence of speed control devices
- Availability of flagman limited
- Limited availability of first-aid box
- Absence of any road safety awareness campaign to workers and neighborhood
- Night visibility almost nil

Bhogra to Elenga Section: The construction zones were limited. Only 13 working zones were created over a length of 70 km). This created less confusion and trouble for the passing vehicles and pedestrians. The compliance of audit is 49% only which is below the desired level. The critical issues are described below:

- Absence of speed control devices
- Poor facility for pedestrian
- Insufficient width available for passing vehicles
- Limited availability of first-aid box
- Absence of any road safety awareness campaign to workers and neighborhood
- Night visibility almost nil

d. Recommendation: In order to ensure safe and orderly passage of vehicles through the construction zone following actions are recommended:

- Review of contract document by road safety expert that required clauses, traffic control and safety items are included in conditions of contract and BOQ
- Carry out pre-construction safety audit
- Ensure that the supervision consultant's team has sufficient number of traffic/road safety engineer to monitor traffic management and safety aspect

- Make traffic management as a pay item in BOQ which will create incentive to contractor
- Use modern digital traffic control devices to increase night visibility
- Monthly progress report should contain a chapter on traffic management and road safety
- Periodic safety audit (at least every six month) should be carried out by independent safety expert to review the compliance
- Carry out post construction audit before opening road to traffic

Risky broken median in Airport to Jaydevpur Under-construction zone

Risky column and boulders without safety barrier at Airport to Jaydevpur Under-construction zone

Side road activity without proper marking at Airport to Jaydevpur Under-construction zone

Construction equipment without safety provision at Airport to Jaydevpur Under-construction zone

HeptaTech Limited Dhaka

Broken Boulders used as median at Airport to Jaydevpur Under-construction zone

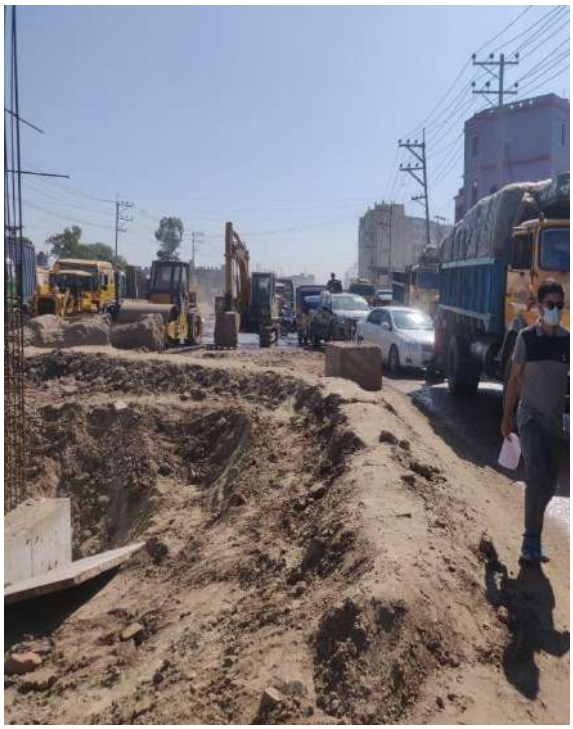
Risky edge drop of road side at Airport to Jaydevpur Under-construction zone

Encroached road at Airport to Jaydevpur Under-construction zone

Large equipment close to road at Airport to Jaydevpur Under-construction zone

Hepta Tech Limited Dhaka

Materials on middle of road at Jaydevpur to Elenga Under-construction zone



Risky rodeside without warning sign at Jaydevpur to Elenga Under-construction zone

Hepta Tech Limited Dhaka

Insufficient police activity at Jaydevpur to Elenga Under-construction zone

unauthorized parking near construction zone at Jaydevpur to Elenga Under-construction zone

Risky edge drop without protection at Jaydevpur to Elenga Under-construction zone

Nonvisible sign post on at Jaydevpur to Elenga Under-construction zone

Site Inspection at under construction zone

Equipped flagman at under construction zone

Hepta Tech Limited Dhaka

CHAPTER 6

CONCLUSIONS

1. ANALYSIS OF ACCIDENT RECORDS

The consultant has collected received accident statistics from different sources (Accident Research Institute –ARI, Newspaper, and the Dhaka Metropolitan Police-DMP) for the study Roads. The information is a bit outdated, but nevertheless throws light on the potential road safety issues. Analysis for specific information is given in following paragraph. **a. Hazardous intersection of Dhaka City Corporation (Ref: Annex- E):** This information is from DMP for the period of 2009-2014.

- On the airport road critical junction is Jasimuddin Road Junction and Kakoli Junction on Banani-Airport Road where total accident is 24 and 18 respectively with percentage of pedestrian accident is 71 percent and 44 percent. This implies that there is high volume of pedestrian crossing at these locations and although pedestrian over bridge is located there it is not being properly used. After the completion of BRT (with the provision of underpass facility for crossing) situation at Jasimuddin crossing is expected to be improved.
- On the DHAKA-Kachpur alignment the critical location is near Postagola Railway crossing where 7 accidents has contributed to 8 fatality implying inefficient management of railway crossing.

b. Accident and fatality information from newspaper (Ref: Annex-F): This information has been collected from newspaper for the period of 2016-2019.

- Banani-Gazipur Section: Every year there is increase in number of accidents, most of the accident occurred during day (84%), major type of accident is hit pedestrian (56%) followed by rear-end (27%), major location of accident is Tongi (40%) followed by Gazipur (20%), Airport road (20%), and Banani (12 %.)
- Joyedpur-Tangail (Elenga) Section: There is no definite trend of annual increase every year, most of the accident occurred during day (90%), major

type of accident is hit pedestrian (42%) followed by rear-end (24%): major location of acc ident is Kaliakoir (60%) followed by Mirzapur (36%).

- Dhaka-Kanchpur Section: Every year there is increase in number of accidents: most of the accident occurred during day (81%), major type of accident is hit pedestrian (56%) followed by rear-end (18%) and vehicle overturn (16%); major location of accident is Jatrabari (71%) followed by Gulistan (17%) .
- Daidkandi-Chittagong Section: Every year there is increase in number of accidents, most of the accident occurred during day (88%), major type of accident is hit pedestrian (34%) followed by vehicle overturn (20%),rear-end (19%), and head on (15%); major location of accident is Daudkandi (26%) followed by Mirsarai, (25%) ,Chouddagram (21%), and Comilla sadar i (18%.).

2. **Dhaka-Chittagong Highway- Critical Issues:** Based on the field survey **carried** out by the consultant it has been observed that within the Jatrabari to Kanchpur section and Daudkandi to Chittagong section of N1 there are **90** openings in the median (within a distance of 195 km) at spacing between 1 km to 6km with an average km 2.17 km).The frequent opening of the median has made the characteristics of the highway like that of a city street. Similarly, there are **408** junctions both major and minor adjacent to the highway (on both side of the road), so on average, there is one junction per km of highway which causes side friction and slows down speed of the vehicle(causing rear end collision). The average daily traffic on this highway is about 20000 vehicle on both direction with predominantly heavy-vehicle movement (truck constitutes 44% and bus constitutes 17% 0f the total) which creates a great risk for vehicles for U turn and right turn movement.

The remedial measure would be to provide service road to contain the minor junctions and at major junction locations or at appropriate interval spacing (depending on detailed traffic volume study, roadside innervations, local demand, population concentration on the connecting area) allow local traffic to enter or exit to the main highway. Reduce the number of openings in the median, allow opening at an appropriate interval (depending on detailed traffic volume study, right turn demand, rest area or other major access demand) with provision of Service lane for u turn and right turn. It is highly recommended to carry out a follow up study to identify location of

median opening; and if required flare the junction to accommodate right turn and u turn lane either at grade or grade separated .Since the construction of Dhaka-Chittagong Expressway is expected to start soon, the option of grade separation would not feasible now**.**

3. **DHAKA-KANCHPUR SECTION OF N1 CRITICAL ISSUE:** During site visit it was observed on both side of the road huge number of people are engaged in market activities with lot of haphazard pedestrian movement. In addition, trucks are parked for long hours on road sides illegally causing movement of people difficult.

The remedial measure could be provision of for a truck parking area at selected locations with proper exit/entry facility.

4. **ANALYSIS OF TRAFFIC COUNTS:** Vehicle mix on a highway is an important factor that contributes to the type and severity of traffic accidents. The consultant has collected recent traffic count information and has analyzed vehicle mix proportion; and its contributing factor to accident.

- **Dhaka-Gazipur Route:** Twenty four hour count was carried out for two days near Abdullahpur which captured the vehicles using Dhaka-Tongi and Dhaka-Ashulia highway. The average daily traffic was 52476. Percentage of truck and van is 17%, percentage of bus is 17%, percentage of car and jeep is 37%, percentage of motorcycle is 19% and percentage of CNG is about 10%.

  .

- **Dhaka-Chittagong Route**: Twenty four hour count was carried out for two days after the Kanchpur bridge near which captured the vehicles using Dhaka-Chittagong highway. The average daily traffic is 20670. Percentage of truck and van is 45%, percentage of bus is 17%, percentage of car and jeep is 29%, percentage of motorcycle is 9% and percentage of CNG is less than one prevent..

From the traffic mix it is evident that there is predominance of commercial vehicle (about 61%) on Dhaka- Chittagong highway. Whereas, because of urban character of the Airport road the percentage of light vehicle is predominant. The type and severity of accident on these two roads are expected to be different.

Table 6.1: Traffic count on Dhaka-Chittagong Highway (Near Kanchpur Bridge)

(Date 27-28 Nov & 01-02 Dec, 2020)

	Dhaka-Chittagong Highway- OUT								
TIME	Truck	Covered Van	CNG	Bus Inter District	Suburban Bus	City Bus	Car/Jeep	Motor Cycle	Total
07-08	215	74	10	158	31	53	483	97	1118
08-09	195	68	4	146	33	34	544	116	1139
09-10	180	54	3	118	29	23	364	117	886
10-11	258	109	6	133	54	20	416	130	1125
11-12	278	131	5	132	42	27	374	145	1133
12-13	313	124	8	128	44	26	375	131	1147
13-14	271	109	6	119	31	27	297	107	966
14-15	241	90	7	146	32	21	257	117	910
15-16	229	98	7	125	29	25	292	129	932
16-17	224	130	6	150	31	24	221	135	920
17-18	208	141	4	111	39	31	152	110	794
18-19	162	93	1	117	44	21	259	102	797
19-20	140	105	2	108	36	24	261	105	778
20-21	160	100	2	79	36	23	211	107	716
21-22	156	109	1	89	21	12	211	59	656
22-23	184	146	1	82	14	5	172	48	649
23-24	268	274	1	150	5	4	110	31	842
00-01	290	339	0	163	2	1	125	23	942
01-02	250	267	0	55	0	0	104	21	696
02-03	246	225	1	27	0	0	84	8	590

03-04	266	269	0	42	0	0	57	3	636
04-05	281	201	1	44	2	1	96	10	633
05-06	180	142	2	28	7	7	99	14	476
06-07	208	156	2	56	16	14	195	39	684
Total	5397	3548	74	2500	572	419	5756	1896	20159

Source: Survey data from ongoing FEASIBILITY STUDY OF BES TERMINALAND DEPOT FOR DHAKA CITY

Table 6.2: Traffic Count on Dhaka-Chittagong highway)
(Date 27-28 Nov & 01-02 Dec, 2020)

	Dhaka-Chittagong Highway- IN								
TIME	**Truck**	**Covered Van**	**CNG**	**Bus Inter District**	**Suburban Bus**	**City Bus**	**Car/Jeep**	**Motor Cycle**	Total
07-08	158	95	19	127	21	47	142	66	673
08-09	168	130	7	170	29	31	200	67	799
09-10	160	106	2	122	30	28	225	118	789
10-11	182	110	3	118	50	16	244	109	830
11-12	204	146	4	128	46	13	216	107	862
12-13	195	131	1	128	50	11	290	119	923
13-14	214	113	1	119	26	21	260	91	844
14-15	215	127	7	136	16	25	273	108	904
15-16	197	123	5	137	28	24	270	111	893
16-17	191	112	2	131	24	28	354	171	1012
17-18	198	132	2	151	22	31	497	246	1278
18-19	226	171	3	174	9	29	575	206	1391
19-20	238	136	2	136	22	26	509	90	1158
20-21	296	180	4	127	11	29	476	110	1231
21-22	337	224	3	104	5	16	345	90	1122
22-23	426	296	2	111	7	10	318	60	1229
23-24	367	302	4	43	1	6	210	35	966
00-01	280	265	2	42	1	3	146	27	764
01-02	280	305	0	24	0	0	131	17	757

02-03	237	244	1	41	0	0	81	10	613
03-04	213	281	2	78	0	1	81	3	658
04-05	194	220	2	139	0	0	66	4	624
05-06	122	128	5	106	2	1	68	8	438
06-07	118	90	6	81	12	12	95	20	431
Total	5410	4165	83	2667	406	402	6065	1987	21183

Source: Survey data from ongoing FEASIBILITY STUDY OF BES TERMINALAND DEPOT FOR DHAKA CITY

Table 6.3: Traffic Count Dhaka –Airport Road (Near Abdullahpur)
(Date 27-28 Nov & 01-02 Dec, 2020)

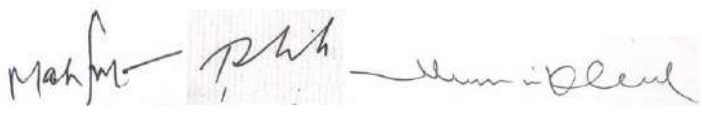
	Abdullahpur- IN								
TIME	**Truck**	**Covered Van**	**CNG**	**Bus Inter District**	**Suburban Bus**	**City Bus**	**Car/Jeep**	**Motor Cycle**	Total
07-08	113	85	220	93	178	330	755	282	2054
08-09	106	81	263	116	196	319	974	671	2723
09-10	118	87	271	112	152	336	927	712	2713
10-11	143	104	277	94	131	253	1031	699	2730
11-12	153	115	292	78	145	315	815	632	2544
12-13	200	125	461	101	153	258	1037	761	3093
13-14	168	136	359	93	135	187	793	671	2540
14-15	142	99	376	128	137	229	918	620	2648
15-16	143	143	322	132	161	222	1083	747	2950
16-17	164	178	365	142	179	250	1180	898	3354
17-18	133	134	341	110	147	182	1243	797	3085
18-19	103	118	290	120	142	152	1337	755	3015
19-20	136	122	317	129	125	197	1399	764	3188
20-21	179	121	277	134	105	173	1221	668	2876
21-22	282	205	258	126	68	149	898	392	2376
22-23	458	255	207	91	71	85	714	286	2166
23-24	513	241	156	64	47	36	556	142	1753

00-01	476	251	94	31	17	13	288	83	1251
01-02	370	145	52	39	7	5	158	37	812
02-03	352	132	43	55	7	2	104	13	706
03-04	302	137	36	108	7	0	87	7	684
04-05	233	96	16	143	9	11	95	9	610
05-06	196	89	43	134	23	32	167	37	719
06-07	124	91	136	90	95	122	459	135	1250
Total	5299	3283	5464	2458	2431	3853	18235	10813	51834

Source: Survey data from ongoing FEASIBILITY STUDY OF BES TERMINALAND DEPOT FOR DHAKA CITY

Table 6.4: Traffic count Dhaka-Airport Road (Near Abdullahpur point) (Date 27-28 Nov & 01-02 Dec, 2020)

	Abdullahpur-OUT								
TIME	Truck	Covered Van	CNG	Bus Inter District	Suburban Bus	City Bus	Car/Jeep	Motor Cycle	Total
07-08	149	98	223	159	112	235	1335	264	2571
08-09	131	96	268	143	155	257	1217	466	2731
09-10	138	106	296	124	179	274	1196	656	2967
10-11	164	113	354	131	145	248	1190	635	2978
11-12	191	137	359	104	146	234	1199	582	2950
12-13	191	141	431	108	153	253	1097	580	2954
13-14	170	128	409	108	120	250	858	508	2550
14-15	169	127	366	115	138	187	1131	614	2846
15-16	152	126	425	116	152	241	997	628	2835
16-17	146	134	468	113	143	217	1243	752	3214
17-18	142	114	401	98	131	184	1196	596	2860
18-19	113	122	340	79	133	207	1183	583	2758
19-20	150	112	352	90	130	213	1262	511	2818
20-21	164	108	281	93	129	203	1004	449	2429
21-22	173	117	298	90	113	189	980	481	2439
22-23	297	179	172	143	75	119	732	305	2020



23-24	291	188	133	87	49	57	623	231	1657
00-01	395	208	85	62	26	21	322	104	1221
01-02	409	247	50	27	9	12	292	33	1078
02-03	409	238	31	20	4	5	155	24	883
03-04	380	228	25	17	4	5	155	18	830
04-05	330	225	43	29	9	11	180	21	846
05-06	216	198	60	81	34	35	273	39	933
06-07	227	159	170	118	77	121	759	127	1756
Total	5293	3641	6031	2246	2361	3772	20573	9203	53118

Source: Survey data from ongoing FEASIBILITY STUDY OF BES TERMINALAND DEPOT FOR DHAKA CITY

5. **Highway Access Management**

During the field visit of the safety audit for 300 km RHD roads, the audit team has observed that most of the road corridor has become chaotic due to lack of highway access management. The unplanned rapid urbanization including illegal encroachment of ROW, absence of bus lay bays, unplanned truck stands and absence of speed change lanes at junctions created obstruction for the safe mobility of the through traffic, built-up areas were not well delineated; moreover, ineffective highway police, and frequent access (both minor roads and property access) to the highway created further complications. An integrated corridor based road safety management team at field level involving representatives from RHD, LGED, Highway Police and Local bodies is strongly recommended to coordinate and regularly monitor the road safety activities related to a particular highway corridor. A well-defined highway access management policy may focus on the following issues:

- Highway access permit approval process
- Access location guidelines (general requirement, access density, access spacing, distance from intersections, traffic access impact study)
- Requirement of auxiliary lanes

- Signalized intersections
- Access type (permanent, temporary, residential, commercial)
- Cost of access and responsibility.

i. Sustainability Issue

There is some sustainability issues related to road safety activities which are described below:

- Quite often the roadside furniture (traffic signs and pavement markings) once installed under a project are not maintained regularly properly due to shortage of fund. Ideally the maintenance of street furniture should be mainstreamed with overall road maintenance. Annual inventory of signs and markings should be carried out in the field and damaged or lost items should be included in the road maintenance work.
- Usually road safety campaign is undertaken during the implementation of road safety or road improvement project but no follow-up is made afterwards. It is desirable that campaigns are carried out in an inclusive manner (involving communities like school teachers/students and industry workers) so that it can be sustained by the communities in future.

ii. Summary of Findings

Details of audit observations have been given in previous chapters' charts, graphs and tables summarizing the following issues:

- Adequacy, location, condition of traffic signs and pavement markings
- Obstruction due to fixed objects within the clear zone
- Provision of truck stand/bus stand
- Night time visibility
- Frequency of access
- Pedestrian facilities

It has been observed that shortcomings on all the above mentioned issues prevails at varying degree on all the five roads and mitigation measures have been suggested in the recommendation section.

RECOMMENDATIONS

1. Mitigation Measures

Government has taken a strategy to upgrade all the national highways to dual carriageway in phases. The audit team has proposed three mitigation strategies: immediate, midterm and long term measures which need to be implemented on a corridor based approach with the involvement of other stakeholder agencies and user groups (LGED, Highway Police, local communities and NGOs involved in road safety):

- **Immediate measures** will involve restoration of shoulder, fixation of sign post, pavement markings, delineation of built-up areas, improvement of pedestrian facilities, and provision of bus bays at required locations, strengthening enforcement, and safety campaign to local communities, stagnant water is due to road side obstruction, poor maintenance of drain which should be a part of routine road maintenance program. Hydrological data analysis to design appropriate drainage facilities can be used to avoid drainage congestion on roads. Immediate measures can be taken for all the five audited highways. Immediate measures should be taken within a year (based on detail investigation comprising of traffic survey, topographic survey and community feedback for pedestrian crossings**). The Audit team suggest details investigations on intersections, bridge/culverts and pedestrian facilities for school zones and built-up areas for immediate interventions.**

- **Midterm measures** will consist of provision of speed change lane at junctions including channelization where required, provision of truck stands, Entrance to local bazars and markets should be made through a service road at the back, service roads in built-up areas (following the principles of the highway access management policy) channelization of junctions, provision of right turn lane through widening road sections (where right turning volume is high), pedestrian over bridge and provision of overpass at very congested location to facilitate movement of through traffic. RHD is recommended to :

    a. Design and location of U loop should be based on detail traffic survey and should be aligned with service road

b. To reduce road accidents there should be designated gap in median, crossing points should be defined with fencing of pedestrian path

c. Training should be given for changing driver behaviour

d. Speed camera should be provided to enforce speed control

e. Road side truck parking terminal, and rest areas should be provided to discourage unauthorized vehicle parking

f. Regular dope checking should be carried out to identify drug addicted drivers

Midterm measures will not be required where RHD has a program to upgrade the road to dual carriageway within next two years.

- **Long-term measures** will consist of provision of grade separation at important junctions, underpass for pedestrians, flyover at congested part of built-up areas, and separate lane for slow moving vehicles. At grade pedestrian crossing can be provided at busy locations within dedicated traffic calming zone supported by signs and signals of adequate traffic speed control devices. Long term measures are proposed where upgrading to dual carriageway is not upcoming within next five years.

Preliminary Recommendations: Unplanned roadside development has created a chaotic situation for vehicle movement on national highways. Economic and commercial activities at these locations contributes to heavy pedestrian movement on road side where most of the time pedestrian facilities (including crossing facilities are not provided. The random and abrupt stoppage of bus also contributes to slow down of speed which causes rear end collision. Due to overtaking tendency of vehicles often overturning occurs. It has been observed that at many locations on the national highways trucksc are parked haphazardly without any defined entry and exit facility which creates huge risk for collision. Following actions are recommended to reduce the risk of accident

- During design consider pedestrian as traffic, carry out necessary survey and provide adequate facilities.
- Near hospitals, rest areas, and trauma center provision should be kept for road crossing of vulnerable road users like to provide fencing/barrier on service road to stop indiscriminate crossing, and guide the pedestrian to designated crossing point.
- Install speed camera to understand extent of over speeding; and to punish the offenders,
- Introduce digital signs to attract drivers attention
- Provide service lane at built-up area
- Reduce the number of opening on the medians
- Highway police unit should be under the Ministry of Transport to be more effective (as practiced in most of the neighboring countries)
- Develop Highway Access Management Policy and enforce it
- Provide truck parking area at appropriate location
- Create safety awareness program along the neighborhood are through focus group discussion
- Adopt remedial measures immediately after a road safety audit has been carried out
- Adopt an integrated road safety program covering the aspects of engineering, enforcement, and awareness building to bring synergy in the system
- While carrying out future road safety audit, factors related to both substantive safety and nominal safety should be considered.

2. Training Program

Globally Road Safety Specialists are in short supply, Bangladesh is also no exception to this. Road safety knowledge needs a very specialized skill as such there is a strong need for preparing an effective training program for RHD staff.

There is a need to mainstream road safety practices at field level. The training program can be organized based on the following principles outlined below:

- **Basic training program** for field staff may include familiarization of road safety manuals and guidelines, and basic design principles of intersection design
- **Advance training program** for RHD's dedicated road safety team may include road safety audit, highway access management, accident analysis, and impact monitoring techniques

3. Institutional Issues

Government has set a target of reducing road crash by fifty percent by 2020. (within the Decade of Action for Road Safety). Moreover, a target has also been set for improving road safety situation by 2030 as part of Sustainable Development Goal (SDG), in order to achieve these targets, the government must implement coordinated and concerted action plan. Reduction of road safety hazards needs multi-disciplinary intervention for which effective coordination is required among stakeholders. For realizing these objectives, National Road Safety Council was established in 2020. Moreover, special institutions (Accident Research institute and Highway Police) have been established, the effectiveness of these needs to be reviewed as part of future road safety study/project. RHD has taken initiative in carrying out road safety audit and strengthen the Road Safety Circle. **Road safety audits should be carried out at design stage, construction stage, post-construction stage, and also periodically: and on specific section of roads (based on the analysis of the annual crash statistics). After implementing road safety mitigation measures there is also a strong need for an impact study to obtain feedback of the intervention.** In order to bring synergy among multi-disciplinary stakeholder agencies and to obtain maximum benefit. a corridor based integrated road safety project (encompassing, physical intervention, enforcement, safety campaign for road users, drivers' training, community participation, and health sector interventions) can be piloted in a selected

priority corridor. This strategy has been used for some World Bank funded projects in Asia and the result is encouraging.

4. Updating of Policies, Manuals and Guidelines

Bangladesh is a unique country, although car ownership is much less compared to many countries, the high population density has resulted unplanned urbanization adjacent to road (sometime within ROW) thereby creating obstruction for the through traffic, and huge demand for pedestrian crossings. Modal share for road transport (which is more than 80% for both passenger and freight traffic) is biased towards road transport, moreover less than 15% of national highway is dual carriageway although they carry about 70% of traffic. There are also some emerging issues described in paragraph below for which new policy and guideline may be required. RHD can take initiative to update existing policy and guideline; and develop new policy and guideline some of which are described below:

- Safety policy for PPP funded road project
- Safety policy for motorcycle
- Pedestrian first policy
- Hawker policy
- Road hierarchy policy
- Updating of road safety guideline and manuals
-

5. Emerging Issues

Currently GDP growth in Bangladesh is more than 7% which is manifested by rapid development of road infrastructure and increase in the growth of motorized vehicles, which has created new challenges for RHD related to road safety. Some of the emerging issues for which RHD needs to adopt are outlined below:

- For the sustainable reduction of road crashes, an integrated road safety program covering the aspects of vehicle, road users, surrounding environment and enforcement is essential. For major highways which are being widened now (like Dhaka-Tangail Highway) the corridor management concept covering operation and

management (including road safety management) the integrated approach should be initiated.

- **Due to increase in the purchasing power of people the number of motorcycle is growing rapidly in Bangladesh (annual growth rate is more than 20%).** Their large presence can be noticed on highways especially, as part of suburban trips around Dhaka and major district towns. Countries like China, Malaysia, Philippines, and Vietnam also experienced the same phenomenon growth of motorcycle in their major cities. Some of these countries have provided separate lanes on highways where large number of motorcycles are present and has become the major cause of crashes. RHD should try to address this issue through new policy and regulation before the situation aggravates further.
- Several elevated expressways are now under implementation, some by private sector, even for the public sector financed expressways the operation and management (including toll collection) will be done by private sector. According to international practice some of the road safety activities (maintenance and replacement of signs and markings, incident management, towing of damaged vehicles, and management of trauma center) are carried out by O&M company as part of their contract. RHD may need to prepare a policy and guideline for this purpose.
- Presently digital roadside advertisement display board is becoming a fashion in major cities; very soon it may be seen in built-up locations or at exit/entry point of national highways. These display boards distract the attention of drivers and may cause crashes. RHD should enact a policy guideline in this regard.

- Roadside Facilities: There is absence of roadside facilities (rest areas, truck parking area, trauma center) for passengers and drivers on major highways and Expressways in Bangladesh which contribute to the mushrooming of restaurants, shops and petrol pumps along the road without proper exit /entry facility. These establishments are not located based on any road safety consideration. It is recommended that RHD takes a program to design and develop modern rest areas on major highways. This will help the road users to make their journey safe and

comfortable. Rest Areas can be developed as per Government policy for all major highways. Rest areas at right locations can reduce roadside hazards to a great extent.

- Operation and Management of Expressways: In Southeast Asian countries (Malaysia and Thailand) operation and management of expressways are delegated to private operator (on long term lease) in an integrated corridor management concept. The operator is responsible for collecting toll, traffic management, speed control, provision of post-accident services (ambulance, towing away of damaged vehicle, first aid facilities and recording of road accidents Using ITS). RHD can start corridor-based Operation and Management for the completed expressways as a pilot project.

FOLLOW-UP ACTION

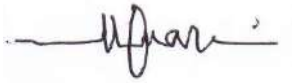
RHD should continue their current initiative of road safety activities and implement the following action:

- Prepare action plan for implementing immediate measures for priority road sections of the audited roads
- Complete the safety audit of the remaining national highways
- Prepare a strategy for safety audit with provision of adequate budget
- Carry out impact studies for completed road safety projects (including road user satisfaction survey).
- Review existing policy and guidelines; and update, if required
- Carryout training need assessment for imparting road safety training to RHD staff
- Impart training to mainstream road safety at field level
- Prepare a report on road safety related projects and training conducted during last ten years which will guide preparation of a five-year road safety plan for RHD
- Prepare a web based newsletter of Road Safety Circle to disseminate information
- Prepare annual report on road safety activities

- Carry out periodic review of the road safety targets in MDG and SDG.

AUDIT TEAM STATEMENT

The road safety audit was carried out by the audit team using all the available material as per references and stated on Chapter 1. Every effort was made to ensure that all safety issues were considered. The above safety audit findings and recommendations are the opinion and judgement of the audit team.



Date: 30.12.2020

Mohi Uz Zaman Quazi
Team Leader
Senior Road Safety Auditor

CHAPTER 7

Figure-1: Field activity

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Figure-2: Consultation with supervisor

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Figure-3: Field activity

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Figure-4: Consulted with Warden

Figure-5: Field activity

Figure 6 & 7: Consultation with safety engineer

CHAPTER 8

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ANNEXURE: A

LOCATION WISE PROBLEMS OF SIGNS

Common Problem Observed

- Sign was required but unavailable
- Sign was broken
- Sign was less visible
- Sign was at inadequate distance from the object

CHAINAGE WISE OBSERVED SIGNS ON N1(DAUDKANDI-CHATTOGRAM)				
Sign Having Visibility Problem				
38.04	58.34	76.84	94.24	109.94
38.94	58.64	77.04	94.54	111.84
40.74	59.24	77.24	94.94	112.24
40.94	59.94	77.84	95.04	115.94
42.04	60.14	82.84	95.24	115.94
44.24	60.44	83.34	96.84	116.54
44.34	61.14	88.24	96.94	117.04
44.94	61.84	88.54	97.54	118.04
45.54	62.64	88.64	98.74	118.14
49.04	66.64	88.74	100.04	118.14
49.84	66.84	88.84	100.04	118.14
50.44	66.84	88.94	100.54	118.34
51.94	68.24	88.94	101.64	118.44
51.94	68.24	88.94	102.54	118.54
53.94	68.64	89.24	105.74	118.64
55.24	68.94	89.54	106.94	119.54
55.24	68.94	91.84	107.14	120.04
56.44	70.74	91.84	107.14	120.84
56.94	71.14	91.94	108.84	121.14
56.94	76.44	93.84	109.44	124.64

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CHAINAGE WISE OBSERVED SIGNS ON N1(DAUDKANDI-CHATTOGRAM)				
Sign Having Visibility Problem				
125.44	139.74	156.64	173.24	201.14
126.54	139.74	160.64	181.44	203.04
127.44	140.04	160.84	182.94	214.64
128.64	142.54	160.94	183.04	216.64
128.84	143.54	160.94	183.74	218.34
129.14	143.64	161.24	184.44	225.14
132.04	143.64	166.04	187.94	225.14
132.24	148.94	166.04	192.14	226.14
134.44	150.74	168.34	192.84	
134.64	150.74	168.84	194.04	
137.44	156.24	169.94	198.24	
138.24	156.54	170.44	199.44	
Sign Having Distance To Object Problem				
40.04	49.84	58.64	88.64	127.44
40.34	50.44	59.24	95.24	129.54
41.84	51.94	68.64	100.04	134.74
44.94	51.94	68.94	105.74	168.34
49.04	58.34	82.84	109.44	214.64

CHAINAGE WISE OBSERVED SIGNS ON N1 (DHAKA-KANCHPUR)		
Sign Having Visibility Problem		
.1	2.4	
2.1		
Sign Having Distance To Object Problem		
.1	2.4	4.8

CHAINAGE WISE OBSERVED SIGNS ON N3 (BANANI-AIRPORT)	
Sign Having Visibility Problem	
5.3	5.4

ADDITIONAL REQUIRED SIGN SUGGESTION N1(DAUDKANDI-CHATTOGRAM)	
Type of Sign	**Sign Required (Nos)**
B3	239
C4	95
A32L	71
A32R	50
U-Turn	24
B7	20
C21	10
B35	13
D3	9
B25	3
B23	3
B12L	2
B13	2
C16	1
A24	1
B2	1
C24	1
C11	1
C10	1

Total	547
N1 (DHAKA-KANCHPUR)	
Type of Sign	**Sign Required (Nos)**
B3	11
C4	11
C21	7
C22	3
C28	2
D3	2
B25	1
B5	1
B7	1
Total	**39**
N3 (BANANI-AIRPORT)	
Type of Sign	**Sign Required (Nos)**
B3	9
C21	4
B47	2
B7	2
C4	2
D6	1
C3	1
C5	1
U-Turn	1
Total	**23**

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(DAUDKANDI to CHATTOGRAM SIDE)

Chainage	Sign Type	Chainage	Sign Type
38.74	C4	61.04	A32R
39.34	C4	61.74	B3
39.54	B3	61.94	C21
39.74	B3	62.34	U Turn
40.74	B3L	62.54	C4
41.74	C24	63.34	B3
43.04	B12L	66.74	B35
43.44	B3L	67.04	B3L
44.04	C4	68.44	A32L
44.64	C4	69.34	A32R
44.94	C21	69.54	U Turn
45.14	A24	70.44	B3
45.34	A32R	71.44	B3
47.84	U Turn	73.54	B3
47.94	B3	74.14	B3
48.44	U Turn	74.44	B13
48.84	A32L	75.54	C4
49.44	A32R	75.74	A32L
50.04	B3L	76.64	A32L
50.14	A32R, B3	77.34	C4
51.94	B3L,A32L	77.74	A32L
52.04	U Turn	77.84	C4
53.44	B13	78.04	B3
53.74	B3L	78.34	A32R, B3
54.64	C21	78.54	B3
54.84	B3	78.64	C4
55.74	A32L	79.14	B3
56.24	A32L	80.04	C4
57.04	B3	80.14	B3
58.04	B3	81.24	C21, B3
58.74	C4	81.54	C4
58.94	C21	82.14	B3

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59.34	U Turn	82.24	A32R
59.44	B3	82.44	C4
59.54	C4	82.94	A32R
59.64	C4	83.74	C4
60.34	B3	85.84	C4

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(DAUDKANDI to CHATTOGRAM SIDE)

Chainage	Sign Type	Chainage	Sign Type
86.94	C4	114.94	B3
87.94	C4	115.44	B3
88.24	B3	115.64	U Turn, A32L
89.24	B7	116.24	B35
89.44	C4	116.54	C11
89.54	C4	117.14	A32R
91.64	B3	117.34	B3
92.14	A32L	117.54	C4
92.64	B3	118.34	B3
93.84	C4	118.64	B25
94.34	C4	118.74	A32R
95.74	B3	118.94	B2
96.74	C4	119.44	U Turn
98.34	C4	119.54	B3
100.74	C4	119.64	A32L
102.64	A32L	121.04	B12L
104.64	A32L	123.24	B35
104.84	C4,C10	123.34	A32R
105.94	A32R	123.74	A32L
106.34	B3	124.94	B3
106.94	A32L	125.34	C4
107.34	B3	127.34	A32L
107.74	A32R	127.44	C21
108.04	B3	128.24	B3
108.54	B3	129.64	C4
108.94	A32L	130.14	C4
109.04	B3	130.44	B3,B23
109.74	A32R	131.74	B3
110.44	B35	132.54	B3

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110.74	B3	132.64	C4
111.64	U Turn	133.14	B3
111.74	A32L	133.34	C4
112.94	B3	134.04	C4
113.44	A32R	134.74	B35
113.74	A32L	135.14	B3
114.14	A32R	135.84	B3
114.24	B3	135.94	B25

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(DAUDKANDI to CHATTOGRAM SIDE)

Chainage	Sign Type	Chainage	Sign Type
137.14	A32L	159.24	B3
137.44	B3	159.94	A32R
137.84	B3	160.64	B3
138.24	C4	160.94	C4
138.34	B3	161.94	A32L
138.94	B3	162.24	C4
139.44	A32R	162.34	B3
139.84	C4, B3	162.44	A32R
141.14	B7	163.44	U turn
141.44	C4	164.94	B3
141.74	C4	167.24	B7
141.94	B3	167.34	B3
142.34	C4	168.14	B3
142.44	B3	168.64	C4
143.34	B3	169.94	B3
144.04	B3	170.64	A32R
145.34	C4	171.64	B3
148.44	C4	172.14	A32L
148.54	U Turn	173.84	C4
148.94	C21	174.64	A32L
149.84	B3	174.94	B3
151.74	A32L	175.74	A32R, B3
152.04	B3	176.04	B3, D3
152.24	A32R	177.04	U Turn, B3
152.54	B3	177.24	A32R
153.04	B35	177.74	B3
153.24	B3	178.24	A32L
153.34	A32L	178.54	B3
153.84	B3	178.94	B3

154.64	A32L	179.34	C4
154.84	B3	179.54	B3
155.84	A32L	179.84	U Turn
157.04	B3	180.34	B3
157.24	C4	180.84	B3
158.04	B3	181.34	A32L
158.44	B3	181.84	B3
158.54	A32R	182.34	C4

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(DAUDKANDI to CHATTOGRAM SIDE)

Chainage	Sign Type	Chainage	Sign Type
182.64	B3	208.54	B3
183.84	B3	211.24	B3
184.54	B3	211.54	C4
184.64	A32R	211.64	D3
185.84	B3	212.04	D3
187.14	D3	212.64	U Turn, B23
187.44	A32L	215.04	U Turn, B7
188.34	B7	215.74	A32L, B35
188.44	U Turn	216.24	C4,Port
189.14	B35	217.14	C4
189.34	B3	217.24	U Turn
190.14	B3	218.04	B35
190.94	B3	219.54	B3
191.54	C4	219.84	B3
191.94	B3	220.14	B3
193.04	B3	221.24	C4
193.24	B7	222.94	C4
193.54	B7	223.04	B3
194.44	B3	223.54	C4
197.04	B3	224.24	A32L
198.34	B3	224.44	B3
199.44	C4	224.84	C4
199.94	C4	225.24	C4
200.14	B3	226.44	C4
201.34	B7	226.64	B3
201.64	B3	227.44	C4
202.74	B3	228.24	U Turn

202.94	C4	228.44	B3
203.04	B3	229.04	B7
203.14	C4	230.24	A32R
203.34	C4	230.84	B3
204.14	A32R	231.04	U turn
204.24	B3	231.24	B3
204.64	U Turn	231.74	D3
204.84	C4	231.94	B3
204.94	C4	232.24	B3, A32R
206.54	C4		

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(CHATTOGRAM to DAUDKANDI SIDE)

Chainage	Sign Type	Chainage	Sign Type
39.14	A32L	69.74	U Turn
39.24	C16	71.64	B3
39.64	B3	72.54	A32L
40.64	A32R, C4	74.54	A32L
43.54	A32L	75.34	A32L
45.04	B3R	75.74	B3
45.14	C21	76.34	A32L
46.44	B3	76.74	B3
46.54	A32L	77.14	B3
47.44	D3	79.14	C4
48.54	A32L	79.24	A32L
51.24	B3	79.44	B3
52.14	U Turn, A32L	80.14	B3
53.04	A32R, B3	80.34	B3
53.74	C4	81.84	C4
53.84	B3	82.14	C4
54.54	B3	83.14	A32L
55.94	A32R	83.44	A32L
56.24	B3	84.64	C4
56.54	A32R	85.34	C4
56.84	A32L	86.44	B3
59.04	B3	90.24	B7
59.94	A32L	92.44	B3, A32R
60.54	A32L	92.84	B3

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61.44	A32L	93.04	C4
62.24	B3, C21	95.84	B3
62.74	B3	96.14	C4
64.24	A32L	97.44	B3
65.64	A32R	98.94	C4
66.34	A32R	99.34	B3
66.64	B3	101.74	B7
66.74	A32L	103.14	A32R
66.94	B3	103.34	A32L
67.14	B3	104.44	A32L, B3
67.34	C4	104.64	B7
67.94	C4	104.74	A32R
69.64	B3	105.44	B7

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(CHATTOGRAM to DAUDKANDI SIDE)

Chainage	Sign Type	Chainage	Sign Type
105.74	B3	138.24	B3
106.34	A32L	139.74	B3
106.84	C4	141.14	B3
107.44	B3	141.54	A32L
107.54	A32L	143.04	A32R
108.24	A32L	144.54	B7
109.24	A32R	145.44	B3, C4
110.24	A32L	146.04	B3
111.04	A32R	146.84	B25
113.74	A32R	147.14	B3
114.34	A32L	148.14	A32L
115.84	B3	148.24	B3
117.54	A32L	149.24	C4
117.94	B3	149.94	B3
119.44	A32R	152.64	B3
119.64	B3	153.64	A32R
120.74	A32R	153.94	B3
121.34	B3	154.94	B3
121.84	C4	156.24	B3
122.04	B3	157.24	B3
122.64	A32R	158.54	B3
122.74	B35	158.64	B3

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123.04	B3	158.84	A32L
123.24	A32R	160.64	A32L
123.84	B3	161.04	A32L
124.54	B3	161.84	B3
125.14	B3	162.84	A32L
125.24	A32L	163.64	B3
125.54	B3	164.24	B3
127.64	B23	165.34	B3
131.44	A32R	167.24	B3
132.74	B3	167.74	B3
134.64	B3	168.04	B3
135.84	B3	168.24	B3
136.14	C4	169.64	B3
136.44	B3	170.44	B3
136.94	A32L	170.94	B3

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(CHATTOGRAM to DAUDKANDI SIDE)

Chainage	Sign Type	Chainage	Sign Type
171.14	A32L	194.14	C4
171.44	C4	195.64	B3
173.44	A32L	197.34	B3
174.04	B3	198.34	B3
175.94	A32L	198.74	B3
176.04	B3	200.34	B3
176.44	B3	202.14	C4
177.04	B7	203.94	B3
177.14	A32R	204.44	A32L
177.44	U Turn	204.94	B3
177.54	A32L	205.54	B3
177.84	B3	205.84	B3
178.54	A32R	206.24	B3
178.74	B3	207.54	B3
178.94	A32R	207.64	C4
179.14	B3	208.14	B3
179.34	A32L	208.84	B3
179.64	B3	209.14	A32R
180.04	U Turn	210.34	B3
180.34	B3	210.74	B3
180.54	B3	211.74	B3

180.94	B3	212.14	B3
181.14	D3	212.34	B3
181.74	A32R	212.74	B3
181.94	B36	215.24	U Turn
182.14	A32R	215.84	C21
183.34	B7	216.74	B3
183.54	B3	217.54	B3
183.94	U Turn, B3	217.84	C4
184.64	C4	217.94	D3
185.54	B35	218.34	B3
188.64	C4	218.44	B3
188.94	B3	218.74	B3
189.64	B7	219.54	B35
190.84	B3	219.94	B3
192.94	B3	220.04	B3
193.34	B7	220.54	B3

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1(CHATTOGRAM to DAUDKANDI SIDE)

Chainage	Sign Type	Chainage	Sign Type
221.74	B3	229.94	B3
222.84	B3	230.84	B3
223.84	C4	231.04	B3
224.14	B3	231.34	C4
224.44	C4	231.54	B3
224.64	C21	231.64	B7
225.84	B3	231.84	B3
226.24	C4	231.94	D3
226.54	C4, B3	232.34	B3
227.84	C4	232.44	A32L
228.54	B3	229.94	B3
228.74	B7	230.84	B3
229.24	B3	231.04	B3

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS

N1 (DHAKA to KANCHPUR SIDE)

Chainage	Sign Type	Chainage	Sign Type
0	C21	2.6	C4

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0.5	D3	2.9	C4
0.6	B3	3.4	B3
0.7	C21	4	C4
0.9	C21	4.5	C4
1.4	C21	4.9	B3
1.8	C4	5.4	C4
2	D3	6.2	C21
2.4	C22	6.5	C28
2.5	B3,C22		

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS
N1 (KANCHPUR to DHAKA SIDE)

Chainage	Sign Type	Chainage	Sign Type
0.3	B7	4.6	B3
0.5	B3	5.3	C4
0.7	C21	5.6	C4
0.9	B3	5.7	C4
1.2	B3	5.9	C28
2.4	C4	6	C21
2.6	B25	6.9	B3
2.8	C22	7.2	B3
3	B3		
4.2	B5, C4		

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS
N3 (BANANI to AIRPORT SIDE)

Chainage	Sign Type	Chainage	Sign Type
0.1	B3	4.2	C21
0.2	C4	4.5	B3
2.3	C5	5.2	B3
2.6	B3	5.8	B3
4	U Turn		

ADDITIONAL REQUIRED SIGN SUGGESTION LOCATIONS
N3 (AIRPORT to BANANI SIDE)

Chainage	Sign Type	Chainage	Sign Type
2	B47, B3	4.1	C3
2.1	B7	4.4	D6

2.4	C21	5.3	C21
2.8	B3	5.4	B3
3.3	B3L,B47	5.8	B7
3.5	C21		

BUILT-UP AREA

Common Problems Observed

- No welcome or warning sign
- Lack of pedestrian facilities
- No speed limit sign or calming devices
- Poor night time lighting condition

BUILT-UP AREA THROUGH N1 (DAUDKANDI-CHATTOGRAM)			
41.19-41.47	105.05-105.46	166.06-166.46	208.37-208.74
43.73-44.37	112.36-112.64	173.8-174	210.89-211.56
60.71-61.44	114.65-114.9	176.62-177.26	211.71-212.63
65.78-66.03	115.14-116.06	179.5-179.82	215.25-215.7
73.05-73.47	116.19-116.73	183.22-183.61	217.04-217.88
78.19-78.62	134.91-135.23	184.09-184.46	218.05-218.43
79.38-80.05	139.79-140.06	188.86-189.22	218.82-219.24
80.45-80.75	140.77-141.14	196.16-196.57	219.83-221.07
80.97-81.41	141.31-142.46	197.61-197.86	221.34-222.86
81.53-82	142.71-143.3	200.34-201.1	225.68-228.09
84.83=85.23	144.82-145.34	201.4-201.89	228.38-231.04
88.52-89.32	145.54-145.78	203.14-203.51	
97.43-97.81	145.98-146.19	204.41-204.63	

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102.23-103.36	162.74-164.59	206.58-207.8	

PERMANENT OBJECTS ON CLEAR ZONE OF N1(DAUDKANDI-CHATTOGRAM)			
Left Side		**Right Side**	
76.54	80.14	85.34	
118.64	142.94		

PERMANENT OBJECTS ON CLEAR ZONE OF N1 (DHAKA-KANCHPUR)			
Left Side		**Right Side**	
0.8		0.5	0.7
		0.6	0.8

TREES ON CLEAR ZONE OF N1 (DAUDKANDI-CHATTOGRAM)			
Left Side		**Right Side**	
228.44			

PAVEMENT CONDITION ON N1(DAUDKANDI-CHATTOGRAM)	
Potholes	
Left Side	**Right Side**
197.24	
Waterlogging	
95.34	130.94
131.94	

PAVEMENT CONDITION ON OF N1 (DHAKA-KANCHPUR)

Potholes (Right Side)	
6.4	6.5
6.6	6.7
6.8	6.9
7	7.1
7.2	7.3
7.4	7.5

NARROW BRIDGE LOCATIONS ON N1(DAUDKANDI-CHATTOGRAM)	
65.04	127.74
66.84	134.84
108.34	185.44
110.54	189.24
122.74	213.64
123.34	213.84
126.64	

STEEP INTERSECTIONS ON N1(DAUDKANDI-CHATTOGRAM)		
39.54	75.64	108.14
40.74	76.74	108.14
40.74	76.74	109.14
46.04	79.34	117.54
46.04	82.24	118.34
50.04	82.24	120.54
50.04	89.34	120.54
51.14	95.74	128.34

51.94	97.44	128.34
54.94	103.94	137.84
59.44	104.34	153.24
65.84	104.34	180.34
66.84	107.44	180.34

Bridge Locations Without Footpath On N1(Daudkandi-Chattogram)				
38.14	102.44	127.74	176.74	205.34
38.74	103.74	128.34	180.44	206.04
41.84	107.14	129.94	181.84	206.64
44.04	108.34	130.64	182.84	207.64
46.44	110.54	131.14	184.24	209.24
47.24	114.04	132.94	185.44	213.14
49.44	114.34	133.54	188.74	213.64
49.84	114.54	134.14	189.24	214.54
50.54	115.14	134.84	190.04	215.84
51.04	116.34	135.44	192.04	217.04
51.24	117.14	136.04	192.64	217.54
52.74	118.24	136.94	197.04	218.84
54.84	118.64	136.94	200.24	220.34
62.44	119.74	138.04	200.74	222.34

65.04	121.64	147.34	200.94	223.74
69.94	122.64	169.04	201.04	225.34
77.24	122.74	169.34	201.14	227.74
86.64	123.34	172.84	202.14	228.44
90.04	124.34	174.44	203.44	230.64
96.24	125.44	175.24	204.04	

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ANNEXURE: B

Check List

Checklist for National Highway on Rural Environment

Highway Name:											RHD Road Safety Audit								Filled by		0	1			
Chainage							0 KM		to	2 KM		CH+2KM													
Structure	Tree/pole	Earthen sholder	Shoulder	Service/ Rest Area	Sign	Pavement	Curve	Parking	Bus Stand (Exist/ Rqrd)	Bridge / culvert	Intersection	Median	Intersection	Bridge / culvert	Bus Stand (Exist/ Rqrd)	Parking	Curve	Pavement	Sign	Service/Rest Area	Shoulder	Earthen sholder	Tree/pole	Structure	Chainage
																									1.9
																									1.8
																									1.7
																									1.6
																									1.5
																									1.4
																									1.3
																									1.2
																									1.1
																									1
																									0.9
																									0.8
																									0.7
																									0.6
																									0.5
																									0.4
																									0.3
																									0.2
																									0.1
																									0

Note

Sign							
1	Type		2	Type			
	Visibility			Visibility			
	Distance			Distance			
3	Type		4	Type			
	Visibility			Visibility			
	Distance			Distance			

Bridge/culvert					
1	Width & Height		2	Width & Height	
	Grrail/Post			Grrail/Post	
	Illumination			Illumination	
	Footpath			Footpath	
3	Width & Hieght		4	Width & Hieght	
	Grrail/Post			Grrail/Post	
	Illumination			Illumination	
	Footpath			Footpath	

Intersection							
1	Channelized	Unchannelized	Roundabout	2	Channelized	Unchannelized	Roundabout
	Angle				Angle		
	Slope				Slope		
	Corner radius				Corner radius		
	Speed Change lane				Speed Change lane		
	Stop Sign/Vehicle				Stop Sign/Vehicle		
	Visibility				Visibility		
	Ped Facilities				Ped Facilities		
3	Channelized	Unchannelized	Roundabout	4	Channelized	Unchannelized	Roundabout
	Angle				Angle		
	Slope				Slope		
	Corner radius				Corner radius		
	Speed Change lane				Speed Change lane		
	Stop Sign/Vehicle				Stop Sign/Vehicle		
	Visibility				Visibility		
	Ped Facilities				Ped Facilities		

Drainage		Speed Bump		Curve	
Chainage	Describe Problem	Chainage	Describe	Type	
				Warning	
				Visibility	
				Sup. Elev	

Railway Crossing		Road marking	
Chainage	Describe	Chainage	Problem

Note

Sign					
5	Type		6	Type	
	Visibility			Visibility	
	Distance			Distance	
7	Type		8	Type	
	Visibility			Visibility	
	Distance			Distance	

Pedestrian Crossimg Facilities					
1	Chainage		2	Chainage	
	Width			Width	
	Sign (Advance)			Sign (Advance)	
	Pedestrian Frequency			Pedestrian Frequency	
	Overbridge/Zebra Crossing			Overbridge/Zebra Crossing	
	Special signal			Special signal	
	Night Visibility			Night Visibility	
	Pedestrian Resugee Island			Pedestrian Resugee Island	

If Parking Facility Available					
1	Advanced sign		2	Advanced sign	
	Type & Width			Type & Width	
	Accelr/Deacclr lane			Accelr/Deacclr lane	

Bus Stands					
1	Intersection (50m)		2	section (50m)	
	Accesibility			Accesibility	
	Signage			Signage	
	Bus Bays			Bus Bays	
	Amenities			Amenities	
	Crossing Facility			Crossing Facility	
	Lighting			Lighting	
	Acc/Dec Lane			Acc/Dec Lane	

Service/Rest Area					
1	Advanced sign		2	Advanced sign	
	Type			Type	
	Accelr/Deacclr lane			Accelr/Deacclr lane	

Median		Turning Facilities	
Condition		Chainage	
Protection		Sign	
Open to Cross		Vel Cntrl	
Night Vision		Ops. Veh	

Generalised Qsns	Ans
1. Is lane width appropriate?	
2. Is Sight Distance Adequate?	
3. If waving lanes are present, are they long enough?	
4. Speed Limit is ok or not?	
5.Do the vehicles abide by the rules?	

Checklist for National Highway on Urban Environment

Highway Name:							RHD Road Safety Audit							Filled by	0	1					
Chainage							0 KM		to	2 KM	CH+2KM										
Structure or Tree/pole	Pedestrian Crossing Facilities	Flyover	Shoulder	Service/ Rest Area	Sign	Pavement	Curve	Parking	Bus Stand (Exist/ Rqrd)	Bridge / culvert	Intersection	Median	Intersection	Bridge / culvert	Bus Stand (Exist/ Rqrd)	Parking	Curve	Pavement	Sign	Service/Rest Area	Shoulder	Flyover	Pedestrian Crossing Facilities	Structure or Tree/pole	Chainage
																									1.9
																									1.8
																									1.7
																									1.6
																									1.5
																									1.4
																									1.3
																									1.2
																									1.1
																									1
																									0.9
																									0.8
																									0.7
																									0.6
																									0.5
																									0.4
																									0.3
																									0.2
																									0.1
																									0

Note

Sign

1	Type			2	Type		
	Visibility				Visibility		
	Distance				Distance		
3	Type			4	Type		
	Visibility				Visibility		
	Distance				Distance		

Bridge/culvert

1	Chainage			2	Chainage		
	Grrail/Post				Grrail/Post		
	Illumination				Illumination		
	Footpath				Footpath		

Intersection

1	Channelized	Unchannelized	Roundabout			2	Channelized	Unchannelized	Roundabout		
	Angle						Angle				
	Slope						Slope				
	Corner radius						Corner radius				
	Speed Change lane						Speed Change lane				
	Stop Sign/Vehicle						Stop Sign/Vehicle				
	Visibility						Visibility				
	Ped Facilities						Ped Facilities				
3	Channelized	Unchannelized	Roundabout			4	Channelized	Unchannelized	Roundabout		
	Angle						Angle				
	Slope						Slope				
	Corner radius						Corner radius				
	Speed Change lane						Speed Change lane				
	Stop Sign/Vehicle						Stop Sign/Vehicle				
	Visibility						Visibility				
	Ped Facilities						Ped Facilities				

Flyovers

1	Surface Condition		2	Surface Condition	
	Sharp Bend/ Turn			Sharp Bend/ Turn	
	Intersection			Intersection	
	Lighting			Lighting	
	Sign			Sign	
	Marking			Marking	
	Railing			Railing	
	Footpath/Ped.			Footpath/Ped.	

Railway Crossing

Chainage	Describe

Speed Bump

Chainage	Describe

Road marking

Chainage	Problem

Turning Facilities

Chainage		
Sign		
Vol/Cntrl		
Ops. Veh		

Median

Condition	
Protection	
Open to Cross	
Night Vision	

Drainage

Chainage	Describe

Note

Sign

5	Type			6	Type		
	Visibility				Visibility		
	Distance				Distance		
7	Type			8	Type		
	Visibility				Visibility		
	Distance				Distance		

Hospital/School Zone

1	Chainage		2	Chainage	
	Speed Limit			Speed Limit	
	Speed Control Device			Speed Control Device	
	Pedestrian Crossing			Pedestrian Crossing	
	Parking Facility			Parking Facility	
	Signage			Signage	
	Footpath			Footpath	
	Acc/Dec Lane			Acc/Dec Lane	

Service/Rest Area

1	Advanced sign		2	Advanced sign	
	Type			Type	
	Accelr/Deaccllr lane			Accelr/Deaccllr lane	

Bus Stands

1	Intersection (50m)		2	Intersection (50m)	
	Flyover (100m)			Flyover (100m)	
	Signage			Signage	
	Bus Bays			Bus Bays	
	Amenities			Amenities	
	Crossing Facility			Crossing Facility	
	Lighting			Lighting	
	Acc/Dec Lane			Acc/Dec Lane	

Pedestrian Facilities

1	Sidewalk Width		2	Sidewalk Width	
	Kerb Height			Kerb Height	
	Surface			Surface	
	Pedestrian Vol			Pedestrian Vol	
	Pedestrian Gender			Pedestrian Gender	
	Notes on Pedestrian facilities			Notes on Pedestrian facilities	

Pedestrian Crossing Facilities

1	Chainage		2	Chainage	
	Width			Width	
	Sign (Advance)			Sign (Advance)	
	Pedestrian Frequency			Pedestrian Frequency	
	Overbridge/Zebra Crossing			Overbridge/Zebra Crossing	
	Special signal			Special signal	
	Night Visibility			Night Visibility	
	Pedestrian Resugee Island			Pedestrian Resugee Island	

Generalised Qsns	Ans
1. Is lane width appropriate?	
2. Is Sight Distance Adequate?	
3. If waving lanes are present, are they long enough?	
4. Speed Limit is ok or not?	
5.Do the vehicles abide by the rules?	

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Checklists - Construction stage audit	
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 roadside hazards have been installed or overlooked. • Is safety adequate for pedestrians of all ages, bicycles, truck and bus movements, motorcycles, cars?
2. Drainage	• Is the drainage of the road and its surroundings adequate? • Are culverts and headwalls in a safe place or are they protected by safety barriers? • Are there any areas of deep water that are not protected by barriers?
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 edge of the road? • Check that no natural feature creates a danger by its presence or loss of visibility.
	• Are there any obstructions remaining in the clear zone?

4. Roadside	• **Are there any "open windows" through which out of control** • **Vehicles could fall? If so, can they be closed, or shielded by safety barrier?** • **Are the Krebs of the correct type?**
	• **Are they located in the most beneficial locations to prevent accidents?** • **Are the terminal arrangements safe?**
5. Safety barriers	• **A re guardrail beams overlapped correctly?** • **Check mounting height and lateral clearance.** • **Check that transitions between barrier types are safe.** • **Check that no other hazards have been overlooked.** • **Do safety barriers restrict visibility?** • **Are there any features that could create a safety problem?**
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?**
7.Services	• **Are access chambers, lines, boxes, lighting columns etc located in a safe place? (i.e. clear of traffic lanes and** **behind any safety barrier).** • **Is there a safe place for maintenance vehicles to stop?**

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8.Alignment	• **Check that the route 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 road and its traffic management are easily recognized 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 road mislead drivers?** • **Is the transition from the old, unimproved road to the new road satisfactory (good delineation, no awkward maneuvers)?**

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9. Intersections	• **Is the intersection clearly visible to approaching drivers?** • **Is the form and function of the intersection clear to drivers on all approaches?** • **Are the STOP and GIVE WAY lines visible at a safe stopping distance?** • **Are there any problems at night that are not apparent during the day?** **<u>Additional items to consider for specific types of intersection:</u>** **Traffic signals:** • **Can the signals be seen clearly on all approaches?** • **Is the alignment of the signal heads correct?** • **Are the signal lamps bright enough? or too bright (glare)?** • **Can the signals be seen by only those who need to see them?** • **Is the sequence of operation correctly set? (Include pedestrian phases if appropriate).** • **Are lane markings for dedicated turns adequate?** • **Are all pedestrian signals functioning correctly and safely?** **Roundabouts:** • **Check that the roundabout is fully visible and** • **Recognizable from all approaches.** • **Check that all signs and markings are correctly placed.**

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 they interfering with visibility at intersections? 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) for the old alignment and temporary signs used during construction have been removed**
11.Surface treatment	• **Does the surface appear to have adequate skid-resistance?** • **Are there any areas where there is excessive bleeding c bitumen?**
12.Pedestrian/ Non Motorized Users	• **Are footways adequate for the number of pedestrians?** • **Are there any obstructions that may affect safe passage of pedestrians?** - **• Are there' dropped kerbs" at crossing points?** • **Are there any gaps in the network of footways?** • **Is there sufficient pedestrian guard railing? Has it been installed correctly?**

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ANNEXURE: E

Hazardous Intersection of Dhaka City Corporation Road Network (Source: DMP, 2009-2014)

Serial No.	Name of the Intersection	Type	X-coordinate	Y-coordinate	Total Accident	Fatal	Normal Injury	Pedestrian Accident	Fatal	Normal Injury	% of Ped. Acc.
1	Kakoli (Mymen. Rd.+ Kamal At. Av.)	Cross	304490-304519	73290-73319	18	10	5	8	7	1	44.4
2	Staff Rd. Crossing (DHK- Mymen. Road)	Tee	304520-304549	73490-73519	0	0	0	0	0	0	
3	Cantt. Zia Colony Gate, Mymen. Rd.	Tee	304520-304549	73550-73579	1	1	0	1	1	0	100.0
4	Kuril, Bishwa Rd. at Level Crossing	Railway	304700-304729	73640-73669	2	3	4	0	0	0	0.0
5	Jasim Uddin Road Crossing	Tee	304460-304489	74100-74129	24	17	5	17	16	2	70.8
6	Tongi Diversion Rd.	Multiple (1cross+ 1tee)	304490-304519	73010-73039	3	2	1	2	2	0	66.7
7	Postagola (Railway crossing+ Madrasha Rd. Crossing)	Cross	304850-304879	72080-72109	7	8	1	2	2	0	28.6
8	Shonir Akhra Crossing	Cross	305030-305059	72170-72199	0	0	0	0	0	0	

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ANNEXURE: F

Banani-Gazipur					
Accident and casualty information					
Year	2016	2017	2018	2019	Total
No. of accident	24	29	30	41	124
Fatality	29	30	26	48	133
Injury	5	9	37	29	80
Total casualty	34	39	63	77	213
Time distribution of accidents					
Day	104	84%			
Night	20	16%			
Age distribution of victims					
Age Group	N/A				
Accident Types					
Accident Type	No. of accidents	Percentage			
Hit Pedestrian	70	56%			
Rear-end	33	27%			
Head-on	10	8%			
Vehicle Overturn	4	3%			
Hit Parked vehicle	0	0%			
Others	7	6%			
Accident Locations					
Accident Location	No. of accidents	Percentage			
Banani	15	12%			
Dhaka cantonment	8	6%			
Airport Road	25	20%			
Vogra	1	1%			
Board Bazar	1	1%			
Tongi	49	40%			

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Gazipur	25	20%			

Newspaper Reported Accident Data

Joydebpur- Tangail (Elenga)					
Accident and casualty information					
Year	2016	2017	2018	2019	Total
No. of accident	28	46	20	42	136
Fatality	56	58	27	49	190
Injury	88	92	24	13	217
Total casualty	144	150	51	62	407
Time distribution of accidents					
Day	122	90%			
Night	14	10%			
Age distribution of victims					
Age Group	N/A				
Accident Types					
Accident Type	No. of accidents	Percentage			
Hit Pedestrian	57	42%			
Rear-end	32	24%			
Head-on	21	15%			
Vehicle Overturn	17	13%			
Hit Parked vehicle	3	2%			
Others	6	4%			
Accident Locations					
Accident Location	No. of accidents	Percentage			
Elenga	1	1%			
Joydebpur	2	1%			
Kaliakoir	82	60%			
Konabari	1	1%			
Korotiia	1	1%			
Mirzapur	49	36%			

Dhaka- Kanchpur					
Accident and casualty information					
Year	2016	2017	2018	2019	Total
No. of accident	15	32	29	27	103
Fatality	14	35	26	27	102
Injury	10	17	32	11	70
Total casualty	24	52	58	38	172
Time distribution of accidents					
Day	83	81%			
Night	20	19%			
Age distribution of victims					
Age Group	N/A				
Accident Types					
Accident Type	No. of accidents	Percentage			
Hit Pedestrian	56	54%			
Rear-end	19	18%			
Head-on	5	5%			
Vehicle Overturn	16	16%			
Hit Parked vehicle	0	0%			
Others	7	7%			
Accident Locations					
Accident Location	No. of accidents	Percentage			
Gulistan	17	17%			
Mayor Hanif Flyover Toll Plaza	1	1%			
Jatrabari	73	71%			
Kachpur Bridge	1	1%			
Matuail	3	3%			
Rayerbag	3	3%			
Sign Board	3	3%			
Sonir Akhra	2	2%			

Daudkandi-Chittagong					
Accident and casualty information					
Year	2016	2017	2018	2019	Total
No. of accident	35	77	84	74	270
Fatality	68	101	103	117	389
Injury	102	245	274	245	866
Total casualty	170	346	377	362	1255
Time distribution of accidents					
Day	237				
Night	33				
Age distribution of victims					
Age Group	N/A				
Accident Types					
Accident Type	No. of accidents	Percentage			
Hit Pedestrian	92	34%			
Rear-end	50	19%			
Head-on	41	15%			
Vehicle Overturn	55	20%			
Hit Parked vehicle	6	2%			
Hit object on road	5	2%			
Others	21	8%			
Accident Locations					
Accident Location	No. of accidents	Percentage			
Daudkandi	70	25.9%			
Comilla Sadar area	48	17.8%			
Maynamati	1	0.4%			
Poduar Bazar	1	0.4%			
Chauddagram	56	20.7%			
Muhuriganj	2	0.7%			
Feni sadar area	24	8.9%			
Mirsarai	67	24.8%			

Fauzderhat	1	0.4%			