ANALYSIS OF RAILWAY ACCIDENTS AT LEVEL CROSSINGS IN DHAKA CITY

by
Md. Rashedul Haque

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BUET, Dhaka

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It is hereby declares that this thesis or any part of it has not been submitted elsewhere for the award of any degree or diploma.

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MD. RASHEDUL HAQUE
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<td>AADT</td>
<td>Annual Average Daily Traffic</td>
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<tr>
<td>ACD</td>
<td>Anti Collision Device</td>
</tr>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>ATCS</td>
<td>Advanced Train Control Systems</td>
</tr>
<tr>
<td>BART</td>
<td>Bay Area Rapid Transit</td>
</tr>
<tr>
<td>BBS</td>
<td>Bangladesh Bureau of Statistics</td>
</tr>
<tr>
<td>BR</td>
<td>Capacity of intersection approach</td>
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<td>CTC</td>
<td>Central Train Control</td>
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<tr>
<td>GPS</td>
<td>Global Positioning Satellite</td>
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<td>JICA</td>
<td>Japan International Cooperation Agency</td>
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<td>LC</td>
<td>Level Crossing</td>
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<tr>
<td>LCC</td>
<td>Level Crossing Controller</td>
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<td>NMT</td>
<td>Non-Motorized Traffic</td>
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<tr>
<td>PNR</td>
<td>Philippine National Railways</td>
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<tr>
<td>SRS</td>
<td>Station Radio Set</td>
</tr>
<tr>
<td>TBTC</td>
<td>Transmission Based Train Control</td>
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<td>TM</td>
<td>Traffic Moment</td>
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ABSTRACT

Traffic safety has become a momentous issue at level crossings in Dhaka city. Level crossing accidents has become a common phenomenon in Dhaka city. There are 42 nos. railway level crossings and 6 nos. railway stations in Dhaka city between Jurine and Abdullahpur of which 29 level crossings are authorized and 13 nos. are unauthorized. 20 of these are associated with major roads and remaining 22 are associated with minor roads.

The operational management and control is one of the important factors of safety at level crossings. Most of the people involved in level crossing operation are not well trained. The geometric parameters at crossings such as visibility, radii of curvatures of approach roads, illegal parking at approach road of crossings, lower length of straight portion of road, width of gates, distance between gate lodge and road centerline etc. are found to be substandard, which are also the key issues for safety problems at level crossings and are taken into account in this study. The road surface condition is also considered as a safety factor. Information is collected from different sources for analysis and identifying the causes of safety problems at level crossings in Dhaka city. The field data collection is also carried out at selected accident-prone level crossings.

The level crossing accidents is 14% of all rail related accidents in Dhaka division and the same in Dhaka city is 53%. So the rate of level crossing accidents in Dhaka city is very high. The analysis of data related to safety at level crossings is carried out extensively. The vulnerable crossing types, the geometric problems, the warning measures are assessed. Advanced controlling system has been studied to suggest for improvement of safety status.

In this study, the Traffic Moments (TM) of the accident-prone level crossings are studied. The TM Values for Khilgaon, Mogbazar and Staff road level crossings are calculated 5977557, 3841182, and 10531296 respectively. These TM values are much higher than the top end TM values for warrant of grade separation intersection considered in Iran, Thailand, and India which are 288000, 1000000, and 100,000 respectively. Therefore, these selected level crossings are suggested for grade separation.
CHAPTER-1

INTRODUCTION

1.1 Background

Bangladesh Railway (BR) is the state-owned rail transport agency of Bangladesh. It operates and maintains the entire railway network of the country. BR is controlled by the Directorate General of Bangladesh Railway under the Ministry of Communications along with Bangladesh Railway Authority which works for policy guidance of BR. Bangladesh Railway covers a length of 2,855 route kilometers and employs 34,168 people (Banglapedia, 2006). BR operates both inter-city and suburban rail systems on a multi-gauge network of broad, meter and dual gauges. There are 2187 level crossings in Bangladesh among which 1512 are authorized and 675 are unauthorized (Bangladesh Railway, 2008).

Dhaka is the capital of Bangladesh with a population of 12.8 million (BBS, 2009) spread over an area 320.00 Sq-Km (JICA, 2008). The existing transport system in the city is unable to cope with the increasing transportation demand. Now-a-days traffic safety has become a significant issue at railway level crossings in Dhaka city. Improper warning system, poor control and management, crossing geometry are considered to be the major factors for safety problems.

There are 42 railway level crossings and 6 railway stations in Dhaka city between Jurine and Abdullahpur of which 29 level crossings are authorized and other 13 are of unauthorized (Bangladesh Railway, 2008), 20 of these are associated with major roads and remaining 22 are associated with minor roads. Furthermore, out of 29 authorized level crossings 11 are of “Special” type, 5 are of type “A”, 11 are of type “B”, and the rest 2 are of type “C” level crossings (Bangladesh Railway, 2010). Around 81 trains are moving through these crossings within which 66 trains are passenger trains and 15 are of goods train as per train schedule of Bangladesh Railway. The train schedule is attached in Appendix-A. During the year of 2009 and 2010, 18 level crossing accidents in Dhaka city were reported within which 2 peoples were died and other 18 were injured (Bangladesh Railway, 2010). Hence, we are loosening lives and properties.
Therefore, to understand the causes of accidents at level crossings and find out their remedial measures are needed. This project work is conducted to analyze the safety problems at level crossings and to recommend some scientific and pragmatic safety measures to improve the performance of the level crossings in Dhaka city.

1.2 Objectives

1. To gather knowledge about issues relevant to safe performance of level crossings.
2. To collect data relevant to railway accidents at level crossings in Dhaka city.
3. To analyze collected data to identify the causes of accidents and related safety problems at selected accident-prone level crossings in Dhaka City.
4. To recommend some remedial measures to improve safety at level crossings.

1.3 Scope of the Project

Limited analysis was conducted on accidents at level crossings in Dhaka city. This research will help the decision makers to improve the safety status of vulnerable level crossings in Dhaka city and hence reduce accidents and economic losses.

1.4 Outline of Methodology

The first task is to review the relevant literature to understand the safety status of level crossings in Dhaka city. Basically, the geometric features, time table of trains, types and classifications of level crossings are considered.

After reviewing the related literature, the collection of data related to level crossings is carried out from various sources. Later on the analysis and interpretation of collected data is done for the identification of vulnerable level crossings from the point of accidents at level crossings.

The field visits of identified level crossings are commenced. During field visit, the existing warning systems, the visibility status, crossing geometry are recorded. The level crossing practices around the world for smooth performance are mentioned so that the compatible measures can be adopted at the crossings which are accident-prone. Based on the analysis of data, field visits and the practices around the world, some
recommendations are made to ensure safety at level crossings. The basic steps of the methodology can be simplified as under:

**Literature review to understand the safety status of level crossings in Dhaka city**

**Collection of accident data related to level crossings from different sources.**

**Analysis and interpretation of collected data**

**Identification of Vulnerable Level Crossings**

**Field observations at few selected vulnerable level crossings**

**Level crossing practices around the world for smooth performance**

Based on the data analysis, interpretations and reviewed example, provide some recommendations

### 1.5 Thesis Organization

The research work consists of five chapters including this chapter. In this chapter the introduction and problem statements are expressed briefly. The objectives and scope of the project are also presented here.

Chapter 2 is literature review. In this chapter the necessary definitions and classifications of level crossings, classification criteria are described briefly. The
warning systems at level crossings are discussed here. The advanced control systems of level crossings are mentioned in this chapter. The index, Traffic Moment (TM) is described as threshold criteria of level crossings and its uses is exemplified here.

Chapter 3 is the safety status of level crossings in Dhaka city. The accident data in the years of 2009 and 2010 are presented here. The interpretation of accident data with the classes and types of level crossings, geometric locations of level crossings as well as the approaching road types are shown. The accident wise responsible persons are mentioned here. The layout plan of rail track is presented in this chapter. In this chapter the level crossings which are vulnerable from safety point of view are defined with respect to accident data analysis.

Chapter 4 is the analysis for four major accident-prone level crossings. From the previous chapter, four level crossings in Dhaka city are found to be most accident prone. In this chapter theses level crossings are visited physically and the safety related information are recorded and presented in order to identify safety problems.

Chapter 5 is the Conclusions and Recommendations. The conclusions of the entire study along with summary of study results are presented in chapter 5. This chapter also contains recommendations for safe and smooth performance of level crossings in Dhaka city.
CHAPTER-2

LITERATURE REVIEW

2.1 General

To pass the vehicular traffic across a railway track crossings are provided on the railway lines. When the road traffic passes at the same level as that level of the railway track, the crossing is called as level crossing (Gupta, B. L. and Gupta, A. 2003). Other types of crossings may be road under bridge or road over bridge where the road traffic passes under or over the railway track. In these both cases necessary clearance between road bed and railway track is maintained as per dimension schedule. A Level crossing (also called a railroad crossing, road through railroad, train crossing or grade crossing) is a crossing on one level ("at-grade intersection") — without recourse to a bridge or tunnel — of a railway line by a road or path. The term also applies when a light rail line with separate right-of-way (or a reserved track tramway) crosses a road (Hall, S. and Mark, 2010). At level crossing, the road surface is kept at rail level and grooves are left along the road surface with the help of guard rails spiked to wooden sleepers.

There is a risk of serious collisions at level crossings and may result in multiple fatalities. Early level crossings had a flagman in a nearby booth who would, on the approach of a train, wave a red flag or lantern to stop all traffic and clear the tracks (Wikipedia, 2010). Manual or electrical closable gates that barricaded the roadway were later introduced. The gates were intended to be a complete barrier against intrusion of any road traffic onto the railway. In the early days of the railways much road traffic was horsedrawn or included livestock. It was thus necessary to provide a real barrier. Thus, crossing gates, when closed to road traffic, crossed the entire width of the road. When opened to allow road users to cross the line, the gates were swung across the width of the railway, preventing any pedestrians or animals getting onto the line.

A safe crossing equates to the ability to:

- Warn users (rail, road and pedestrian users) of the existence of a level crossing
- Warn users of the approach of conflicting traffic with sufficient time for protective action to be taken
- Allow for the passage of specified (size, weight and speed) road, rail and pedestrian traffic.

With the appearance of motor vehicles, this barrier became less effective and the need for a barrier to livestock diminished dramatically. Many countries therefore substituted the gated crossings with weaker but more highly visible barriers and relied upon road users following the associated warning signals to stop. In many countries, level crossings on less important roads and railway lines are often "open" or "uncontrolled", sometimes with warning lights or bells to warn of approaching trains (shown in figure 2.2). Unguarded crossings represent a safety concern; many accidents have occurred due to failure to notice or obey the warning. Railways in the United States are adding reflectors to the side of each train car to help prevent accidents at level crossings. In some countries, such as Ireland, instead of an open crossing there may be manually operated gates, which the motorist must open and close (Hall, S. and Mark, 2010). These too have significant risks, as they are unsafe to use without possessing knowledge of the train timetable: motorists may be instructed to telephone the railway signaler, but may not always do so. Road-rail crossings occur on isolated country roads and in areas of high-density metropolitan traffic. In the former case the road user may be in a low state of arousal, while in the latter traffic may be overstressed. In both cases road users are not in the best state to deal with the additional demand imposed by a level crossing, and performance is sub-optimal. The original design for a level crossing consisted of a flagman in a nearby booth that, on the approach of a train, would race out, usually with a stop sign or red lantern and (attempt to) stop all traffic and clear the tracks. Gates, manually or electrically closable, which barricaded the road way were later introduced. The gates were intended to be - and at the time of the design of the original crossings actually were - a complete barrier against intrusion of road traffic, vehicular or animal, onto the railway.
2.2 **Classifications of Level Crossings**

The classification of level crossings is based on a joint consideration of the nature of the road, the number of road vehicles and number of trains passing over the level crossings, controlling systems, visibility etc. Different classifications of level crossings are described as under:

2.2.1 Classification of level crossings based on controlling system (Gupta, B. L. and Gupta, A., 2003):

a) Guarded/Controlled level crossing
b) Unguarded/Uncontrolled level crossing

**a. Guarded/Controlled Level Crossing:** In case of guarded level crossings, swing type gates, moveable barriers, or at least chains are placed to prevent the movement of vehicular traffic on road while the train is passing over the level crossing to avoid the accidents. The gates or moveable barrier are operated by watchmen of railways and it is the duty of the watchmen to see that no train passes until the gates of level crossings are closed by them. The gates may be operated manually or mechanically.

![Fig 2.1: Controlled Level Crossing](image)

**b. Unguarded/Uncontrolled Level Crossing:** In case of unguarded level crossings, no such arrangement is made and hence, there is danger of accident between the vehicles on the road and moving train. Unguarded
level crossings should be avoided as far as possible and should only be recommended for crossings of the track with less important roads.

Figure 2.2: Unguarded/Uncontrolled Level Crossing

2.2.2 Classification of level crossings based on number of road vehicle and trains:

i. Special

ii. A Class

iii. B Class For roads

iv. C Class

v. D Class For cattle crossing

i. **Special Class Level Crossing.** These level crossings are provided where train traffic is exceptionally heavy and on very important through roads suiting to individual site conditions.

ii. **Class A Level Crossing.** These classes of level crossings are provided where train density is about 14000 vehicles daily and provincial and local metalled roads cross the railway track. They may be guarded or unguarded.

iii. **Class B Level Crossing.** This type of level crossing are on grand trunk roads.
iv. **Class C Level Crossing.** This class of level crossings are provided on unmetalled roads.

v. **Class D Level Crossing.** This class of level crossings are provided on unimportant roads and usually are kept as unguarded. Only a passage for pedestrians and cattles is provided.

The requirements of various classes of level crossings of India and Bangladesh can be discussed as under:

Indian Railways fulfils the following requirements for level crossing classifications (Gupta, B. L., 2003):

**Class A** level crossings may be guarded/controlled or unguarded/uncontrolled and must satisfy the following requirements:

a) The angle of crossing preferably should be $90^\circ$, but in no case, it should be less than $45^\circ$.

b) The minimum radius of approach road should not be less than 45 m and the maximum gradient should be 1 in 30.

c) From the approach road, the view of the level crossing should be clear.

d) The road meeting at the cross level should be straight for a length at least 30 m on either side of the railway line.

e) At least 7.5 m level length of road on each side of the gate should be provided to act as a platform for the waiting vehicles.

f) A maximum 7.3 m width of gate should be fully paved.

g) The closed gate should remain at right angle to the road and one part of it should be within 2.1 m from the centerline of the adjacent railway line of the gate.

h) At least two watchmen should be provided on each level crossing, but their huts neither should obstruct the clear view of the level crossing, nor it should on road of formation.
In case of **class B** level crossings, except the following three points, rest all other requirements as mentioned above also apply to this class of level crossings.

i) The maximum gate width may be 3.7 m instead of 7.5 m.

j) The minimum radius of approach road may be 30 m.

k) Only one gateman may be sufficient.

**Class C** level crossing should fulfill the following conditions:

a) The minimum gate width should not be less than 3.7m.

b) The level length should not be less than 7.5m

c) The minimum of metalled road portion should not be more than 2.7m.

d) The maximum gradient for approach road should not be more than 1 in 20.

In case of **class D** level crossings, only a passage for pedestrians and cattle is provided.

The requirements of various classes of level crossings as per Bangladesh Railway (BR) are described as under (Bangladesh Railway, 1980):
Table 2.1: The Criteria of Different Classes of Level Crossings

<table>
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<tr>
<td></td>
<td>Special</td>
<td>A Class</td>
</tr>
<tr>
<td>1. Minimum Length of guard rail (for a square crossing)</td>
<td>30 or 36 ft</td>
<td>24 ft</td>
</tr>
<tr>
<td>2. Minimum width of gates at right angles to the centre line of the road</td>
<td>24 to 30 ft</td>
<td>18 ft</td>
</tr>
<tr>
<td>3. Minimum distance of gate posts from centre line of nearest track for broad gage (meter gauge)</td>
<td>9.5 ft (8 ft)</td>
<td>9.5 ft (8 ft)</td>
</tr>
<tr>
<td>4. Positions of gates when open to road traffic</td>
<td>Across or towards the line</td>
<td>Away from or towards but not across the line</td>
</tr>
<tr>
<td>Details</td>
<td>Dimensions etc. for various class of crossings</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5. Provision of wicket gates for full passenger</td>
<td>To be provided, except where footover bridges are provided</td>
<td>Same as for &quot;Special&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as for &quot;Special&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not to be provided</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not to be provided</td>
</tr>
<tr>
<td>Wickets should be of such design that cattle cannot easily readily pass through them.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Lights as observed by road users</td>
<td>Red when closed to the road. White when open to the road.</td>
<td>Same as for &quot;Special&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as for &quot;Special&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as for &quot;Special&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as for &quot;Special&quot;</td>
</tr>
<tr>
<td>Not to be provided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Light as observed by drivers of approaching trains</td>
<td>No light.</td>
<td>No light.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No light.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No light.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No light.</td>
</tr>
<tr>
<td>6. (a) (2) Lights as observed by Drivers of approaching trains</td>
<td>Red when gates closed across the track</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Where level crossings are inside station limits, they should preferably be beyond the advance starters or should be at an adequate distance (i.e. about 800 ft) ahead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Interlocking of gates with signals, or other protection against trains running through a crossing when open to road traffic.</td>
<td>All gates, if within station limits, shall be locked with station signals or if outside station limits with special signals, except in special cases under rules approved by the government inspector of Bangladesh Railways.</td>
<td>Same as for &quot;Special&quot; if within station limit. If outside station limits gates should be coupled and should be coupled and a warning bell, controlled from the adjacent station may be provided.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No special provision to be made unless the line is on a curve and the line is on a curve and the view is obstructed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as for &quot;B&quot; class</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>It is very desirable on busy level crossings to couple both the gates on each side. Where 'A' class of 'B' class level crossings are outside station limits, the clear distance between the crossing and an outer signal should not be less than a full train length.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Width of Metalling</td>
<td>(a) Same width as gates</td>
<td>(a) &amp; (b)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as &quot;Special&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as &quot;Special&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as for gates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same width as for gates</td>
</tr>
<tr>
<td>(a) Between gates</td>
<td></td>
<td>(a) &amp; (b)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same as &quot;Special&quot;</td>
</tr>
<tr>
<td>(b) Outside gates up to the railway boundary.</td>
<td></td>
<td>(a) &amp; (b)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Same width as metalling on the road outside the railway boundary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In case of 'D' class crossings, the metalling need not to be carried beyond 10 ft outside the gates.</td>
</tr>
<tr>
<td>Details</td>
<td>Dimensions etc. for various class of crossings</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td><strong>Special</strong></td>
<td><strong>A Class</strong></td>
</tr>
<tr>
<td>9. Formation width of road surface outside of gates</td>
<td>Same as the rest of the road outside the railway boundary</td>
<td>12 ft. wider than metalling</td>
</tr>
<tr>
<td>10. Gradient of the roadways</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>(a) Between gates</td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>(b) Outside gates</td>
<td>For 25 ft. and then not steeper than 1 in 14.</td>
<td>For 25 ft. and then not steeper than 1 in 30.</td>
</tr>
<tr>
<td>11. Angles of crossing between gates.</td>
<td>Not less than 450 between centre lines of road and railway</td>
<td>Same as for &quot;special&quot;</td>
</tr>
<tr>
<td>12. Minimum length of straight portion of road outside gates.</td>
<td>40 ft.</td>
<td>30 ft.</td>
</tr>
<tr>
<td>13. Minimum radius of centre 200 ft. line of road on curved approaches within 150 ft. of the centre line of the Railway.</td>
<td>200 ft.</td>
<td>150 ft.</td>
</tr>
<tr>
<td>14. Minimum number of three of gate-keepers.</td>
<td>Three</td>
<td>Two</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.3 Traffic Threshold Criteria for Level Crossing Improvement

Most of the region’s railways apply traffic threshold criteria as a basis for determining the type of level crossing installations, which should be provided at individual road/rail intersections. In most cases, these criteria are based on the combined daily rail and road traffic passing through level crossings and are designated “Traffic Moment” indicators (UNESCAP, 2000). They are computed as the product of daily train numbers and the daily numbers of road vehicles using the crossing (Traffic Moment = Daily number of road vehicles × Daily number of trains). At the bottom end of the TM scale, Warning Signs only are indicated. The medium range of TM value indicates Manual Barrier and at the top end of the TM scale, grade separation of crossings is indicated (UNESCAP, 2000). Use of Traffic Moment to model exposure to collision risk makes an important assumption: that trains and users arrive at the crossing independently and that each train and user has an equal opportunity for collision shown in figure 2.3 (UIC, 2008).

### Dimensions etc. for various class of crossings

<table>
<thead>
<tr>
<th>Details</th>
<th>Special</th>
<th>A Class</th>
<th>B Class</th>
<th>C Class</th>
<th>D Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Minimum distance of gate lodges from</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Center line of nearest track</td>
<td>a) 20 ft</td>
<td>a) 20 ft</td>
<td>a) 20 ft</td>
<td>a) 20 ft</td>
<td></td>
</tr>
<tr>
<td>b) Edge of road</td>
<td>b) 20 ft</td>
<td>b) 15 ft</td>
<td>b) 15 ft</td>
<td>b) 10 ft</td>
<td></td>
</tr>
<tr>
<td>16. Fencing on lines which are not fenced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>throughout their length</td>
<td>Minimum</td>
<td>Minimum</td>
<td>Minimum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>length of 50 ft. from each gate post</td>
<td>length of 50 ft. from each gate post</td>
<td>length of 50 ft. from each gate post</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Warning to road traffic of the proximity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of a level crossing.</td>
<td>Conventional signs will where considered necessary, be</td>
<td>Same as for &quot;Special&quot;</td>
<td>Same as for &quot;Special&quot;</td>
<td>Where gate or chains are provided, the gate post must be painted</td>
<td>Post must be painted white</td>
</tr>
</tbody>
</table>

*Source: Bangladesh Railway (1980)*
The applications of TM as an Index of threshold criteria for some countries are given below:

a) In Viet Nam the TM indicators have been set at unrealistically low levels and consequently are not capable of practical application.

b) In India while the TM indicators have been set at realistic levels, budget restrictions have prevented full application of the TM criteria. Thus, in India for example, where a TM value of 100,000 indicates that a crossing should be grade separated, there are many level crossings which have long since passed this threshold level, yet have still not been grade separated (UNESCAP 2000).

c) In Japan, the JR West Railway Company has recently introduced a composite index based on allocated scores to determine the standard of level crossing protection required at individual locations. In addition to road and rail traffic densities, other factors to which scores are assigned include the accident histories and physical characteristics of individual crossings. High aggregate scores will indicate priority for grade separation. Low aggregate scores will suggest minimal standards of level crossing protection. Still other criteria have been developed which incorporate scores for level crossing closure time (high = low closure time; low = high closure time). While a case may be made out
for improving the criteria applied to level crossing improvement, it is unlikely that there would be a better substitute for TM indicators set at realistic levels, *supplemented by accident risk assessments* (UNESCAP 2000).

d) Philippine National Railways (PNR) applies criteria based on the location of a crossing. For example, if the crossings is located inside Metro Manila it must be staffed and at minimum equipped with lifting barriers flashing lights and fixed road warning signs. On the other hand, if the crossing is located in a rural area it is provided with fixed road warning signs only. Altogether, the PNR classifies its level crossings into eight groups having homogenous location characteristics.

e) TM is being used by Islamic Republic of Iran. Based on research carried out by the Iranian Islamic Republic Railway proposes to establish criteria for assessment of level crossings as follows (UNESCAP 2000):

<table>
<thead>
<tr>
<th>TM Range</th>
<th>Indicated Type of Crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM &lt; 72,000</td>
<td>No Protection-Simple fixed road signs at crossing approaches</td>
</tr>
<tr>
<td>72,000 ≤ TM ≤ 288,000</td>
<td>Mechanical or electrically operated lifting barriers; fixed warning board and flashing warning lights against road users; fixed crossing warning board against train drivers</td>
</tr>
<tr>
<td>288,000 &lt; TM</td>
<td>Road overpass or Underpass</td>
</tr>
</tbody>
</table>

f) In Thailand, an index of road and rail traffic, called a Traffic Moment (TM) indicator is used to establish priorities for level crossing installation or upgrading. State Railway of Thailand staff presently takes road traffic counts at least once a year for the busier indictors for individual crossings are as follows:
<table>
<thead>
<tr>
<th>TM Range</th>
<th>Indicated Type of Crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{TM} \leq 10,000$</td>
<td>Fixed road warning Signs only</td>
</tr>
<tr>
<td>$10,000 &lt; \text{TM} \leq 100,000$</td>
<td>Manual Barriers</td>
</tr>
<tr>
<td>$100,000 &lt; \text{TM}$</td>
<td>Road overpass or Underpass</td>
</tr>
</tbody>
</table>

In Bangladesh, level crossing installation and upgrading priorities should also be established on the basis of the assumed road and rail traffic volume likely to use crossings in future. Bangladesh Railway did not establish the TM range.

### 2.4 Warnings Systems at Level Crossings

Warning signs are an important mean to promote safety among road users as they approach a level crossing. The warnings should alert the road users of the danger they may encounter at the level crossing, describe its nature, and explain what will happen if the user fails to comply (SELCAT, 2008). The problem with warnings is that they often fail to work. In order to be effective, the road user must process the warning in a series of mental operations: The user must first notice the warning, and then the warning must be perceived (i.e. it content read), next the road user must properly understand the meaning of the warning in order to finally comply with it. Warning signs around level crossing are usually noticed, seen, understood but unfortunately ignored, sometimes, by road users. Road users who view warning signs around level crossing use a mental model to perform a cost-benefit analysis which may lead to compliance failures for warnings. First, road users have a general knowledge about level crossings and how they work; they may also have a set of beliefs and expectations based on experience with the same or similar level crossing environments or technology. Finally they enter the level crossing with a goal and strategy for achieving that goal eg (‘I want to cross the LC as soon as possible’). The three main components that constitute the cost-benefit analysis performed by the road user to decide to whether or not comply with the warning sign are: cost of compliance, perception of danger level and personal and social and cultural decision-making factors (SELCAT, 2008). Danger perception has a strong influence on the result of the cost-benefit analysis performed by the road user before complying or not with warning around level crossing: the greater the perceived risk and hazard, the greater the likelihood of compliance. Several factors may influence the level of perceived risk.
including road users’ familiarization with level crossing systems, dilution of important warning signs in the presence of other non safety relevant signs, (ie a sign indicating to the road user that they approaching a level crossing may be diluted in the presence of an advertising sign), finally the physical appearance of the warning sign (size, color, shape, location) may inadvertently communicate hazard severity.

2.4.1 Classifications of Protection Systems at Level Crossings

Railway safety is a crucial aspect of rail operation the world over. Malfunctions resulting in accidents usually get wide media coverage even when the railway is not at fault and give to rail transport, among the uninformed public, an undeserved image of inefficiency often fueling calls for immediate reforms. The Level crossing protection system can be classified broadly into 3 categories (KRCL, 2009):

a) Manned or operated level crossing protection system:

In case of Manual operated Level crossing protection system, the man at the gate actuates the Level crossing protection, acts when he receives communication from the signal room by means of a telephone call. Since it is mainly based on human operations, there is every likely hood that it may fail due to human errors. However, since this system is being cost effective it is very much in place in the developing countries like Bangladesh, Iran, Egypt etc.

b) Train Sensor Based Automatic Level Crossing Protection System:

This system is based on Rail wheel sensors viz., Track Circuits, Proximity Sensors etc., which are located at about 2 kms from the Level crossing and provides a time lag for about 2 kms for a bullock-cart in rural areas to cross the Level crossing, but the system has no parameters which make the system cumbersome and available. The system demands extension of power supply to remote places to run long cables from sensor to the system, which is expensive and reduces reliability.

c) Radio based Level crossing protection system:

Radio based level crossing protection system, such as ACD (Anti Collision Device) provides safety at level crossings, in addition to other features such as anti collisions on track. This network based radio system keep communicating with Gate ACD
system (either manned or unmanned) and indicates the train arrival by wireless. With this information, Level crossing protection system then start activation by lowering the barrier, flashing the road side lights and sounding alarm bells etc.. The Architecture of a typical railway level crossing is given below:

![Figure 2.4: Architecture of a Typical Railway Level Crossing](Source: KRCL, 2009)

### 2.4.2 Currently Available Level Crossing Protection Systems

(a) Crossing Warning Signals:

In general, these are of two types: automatic and manually operated signals. Manually activated signals are operated by level crossing staff, on instructions transmitted by telephone or telegraph signal from the nearest station (KRCL, 2009). Automatic warning signals need short track circuits or markers which detect trains and activate warning indications at level crossings. These warning indications are usually flashing lights, or sounds emitted by bells or claxons (horns), or a combination of these two. If visibility at a crossing is a problem, then flashing lights may be increased in intensity and may be installed so as to suit the layout of the surrounding land and buildings. Similarly, audible-warning devices may be increased in frequency and amplitude, to compensate for the sound absorption qualities of the physical environments of level crossings.
From experience, the level of safety afforded by these devices on their own is insufficient. This is particularly true in the case of level crossings accommodating two or more tracks. If unmanned level crossings are to be contemplated in these situations, then some form of train approach indication becomes very essential.

(b) Mechanical Crossing Barriers:

Mechanical crossing barriers are operated by level crossing staff using hand or electrically powered levers, winches or windlasses. In addition, mechanical barriers providing complete protection of level crossings are connected to manually operated warning signals. Combination systems of this type are widely used within the developing countries of Asia since they may be manufactured inexpensively within the region. By contrast, automatic electronic crossing devices are wholly manufactured within developed countries and must be imported at substantial cost for installation within the developing countries of the region. There are three main types of mechanical barriers: lifting booms, swinging booms or gates, and trolley gates. Of these types, the trolley barrier provides the most effective form of protection against break-through by heavy goods vehicles. However, of necessity trolley barriers are of heavy construction and are best deployed by means of remotely controlled electric motors. This type of barrier is used at a major level crossing intersection in Hanoi, Vietnam. Swinging type barriers afford a generally greater level of protection than lifting barriers against breakthroughs, but particularly when installed at double track level crossings they must be equipped with efficient locking systems.

(c) Train Detectors

Automatic devices of this type detect the presence and speed of a train in block sections at the approach to a level crossing. They are installed only near unmanned level crossings and usually consist of a series of transponders inserted in track at certain intervals and interlocked with level crossing barriers and warning signals. Such devices must be capable of detecting train speeds since the elapsed time between a train’s detection and its arrival at a crossing will be a function of its speed. The alternative to installation of automatic train detectors is to have train starting signals at stations interlocked with level crossing barriers and warning signals. These signals have the capability of identifying the type and hence speed of different trains and will
transmit the appropriate signal to the level crossing protection system in order to activate it at a specified time before the arrival of a train. In the case of manned level crossings the function of the train detector is substituted by level crossing staff, who receive advance warning by telephone or telegraph from the nearest station of the arrival of a train.

(d) Obstruction Warning Devices for Level Crossings:

These types of devices are generally installed at unmanned level crossings. Their function is to provide signal warnings to train drivers when level crossings are blocked by motor vehicles or other obstructions. They mainly consist of phototubes, supersonic wave emitting devices or laser beam transmitters which detect obstructions on crossings and are interlocked with distant signals before level crossings. When activated by the presence of obstructions (e.g. stalled motor vehicles), they transmit a flare indication to distant signals via short track circuits, allowing train drivers to apply emergency braking and to stop their trains short of the crossing.

(e) Automatic Crossing Barriers

These have multiple functions, including provision of:

- a physical barrier to prevent or (perhaps more realistically) to dissuade motorists from entering a level crossing into the path of an oncoming train;
- a crossing warning signal, indicating the presence of a level crossing;
- a train approach indicator warning of oncoming trains; and
- a crossing failure indicator warning of mechanical or electrical failure of level crossing equipment.

If desired, train detectors and obstruction warning devices based on a phototube system may be connected to automatic crossing barrier mechanisms.

There are many types of automatic level crossing barriers, the most commonly used types being swinging or lifting booms. Automatic trolley gates exist and a small number in fact have been installed within the region (mainly in Viet Nam), but in general use of the trolley gate system is restricted to manned level crossings.
Automatic swinging boom barriers have a greater number of mechanical parts than automatic lifting boom barriers and thus are exposed to greater risk of spare part shortages.

Automatic half barrier level crossings are found in many countries of Europe. This system functions satisfactorily when the road carriageways may be physically segregated. In the case of many two lane rural roads in Europe, however, lane segregation has not been possible and accidents caused by motorists making slalom (or S pattern) moves through half barriers are frequent. Despite the relatively low cost of the half barrier system it has not been widely used in Asia. Indeed, Japan withdrew from use of this system several years ago.

To enhance the visibility of barriers to motorists, a number of different methods have been devised including painting in tiger stripes and use of large diameter booms, double booms and high positioned booms (for trucks).

### 2.4.3 Future Trends

Systems likely to be available in future for the protection of level crossings are of following types (KRCL, 2009):

(a) Advanced Radio-Based Train Control System

The American and Canadian Railway Associations began to study Advanced Train Control Systems (ATCS) in 1984. The systems then investigated involved the use of radio, satellite and radar communications.

The Indian Railways has been evaluating a radio-based ATC system designed by Siemens Application of ATCS will allow elimination of track circuits and signals and in future will facilitate high density and unmanned train operations. This system provides for the detection of a train’s position by means of a radio transmitter installed on the locomotive which then transmits this information to a wayside base (Figure 2.4). The wayside radio base determines the velocity at which the train will be able to run safely within the section given information inputs as to the gradient curvature and condition of the track. It then transmits this information back to the train either as data displayed within the cab or as direct commands to the train’s throttle and braking systems. For operation through level crossings, the train onboard computer calculates
the time at which the level crossing warning lights or bells are switched in based on the train velocity and level crossing position. This system may be overridden by train controllers in the event of equipment malfunction.

In addition, the system has blocking control, level crossing control and the functions of ATC (Automatic Train Control) and CTC (Central Train Control) systems. The basic components of the ATCS are a Train Radio Set (TRS), a Wayside Radio Set (WRS), a Station Radio Set (SRS) at Control Stations, a Level Crossing Controller (LCC) and connecting systems between the train, wayside locations, level crossings and control stations. TRS are installed at both ends of each train. WRS are installed at the trackside (at intervals of 500m to 1500m on the BART system). SRS are installed at 20 station locations on the BART system. Signals and track circuits between stations are not needed at this system.

**ATCS - Level Crossing Safety Features**

Existing level crossing systems represent a weak point of safety management and control on railways. Adequate warning time is needed for safe level crossing operation. Existing systems having electronic train detectors work on the basis of short track circuits installed in the track approaches on either side of level crossings.
These systems control the beginning and end of the warning indication. The disadvantage of this system is that the warning interval becomes disproportionately long with slow trains, because maximum train speeds normally determine the interval between the beginning and end points of track circuited sections, and thus a train operating at slow speed will take significantly longer to pass between these two points. Further, existing crossing obstruction detectors do not stop trains automatically if crossings are obstructed - they merely provide a wayside signal indication of such obstructions to the train driver, leaving the responsibility for brake application to the driver.

With new ATCS systems, warning indications begin from the position at which an emergency brake application would be needed in order to bring a train to rest before a crossing, the braking distance being calculated automatically by the system on the basis of a train’s speed past the radio relay point. The computers on board trains calculate their position and send the train number, train position and time until beginning of the warning indication to the Level Crossing Controller (LCC) through the Wayside Radio Station (WRS). The WRS picks up signals from the closest approaching trains, but only begin to transmit the signal to the LCC in order to activate the warning indication at the calculated control time. If no level crossing obstruction indication has been received by this time, the WRS will permit the approaching train to pass and will transmit crossing warning and barrier activation messages to the LCC. The train will then be permitted to pass through the level crossing on schedule. However, if an obstruction warning indication is received, the WRS will transmit a signal to the train receiver (TRS) in order to activate emergency braking.

(b) GPS-based Advanced Train Control System

Global Positioning Satellite (GPS) communications systems are now in common use for sea, air and land transport navigation applications. GPS uses communications links with number of satellites to establish the navigation coordinates of aircraft or surface transport receivers. GPS systems are on the whole very inexpensive – a receiver for an automobile now costing as little as US$ 500.

As compared with ATCS, the advantage of using GPS for train control functions is that it entirely eliminates the need for Wayside Radio transmitter links. However, the
system does have some shortcomings, the most significant of which is that in civilian applications it is subject to significant error. GPS was originally developed for military use with links to satellites reserved for military communications. In military applications, the error is no more than several centimeters, but in civilian applications (using less reliable satellite fixes) the error can be as much as 30 meters – certainly excessive for locating trains in relation to level crossings. If it were possible to obtain access to military satellites, considerably more accurate navigational information would be available at minimal cost.

2.4.4 Financial Analysis of Alternative Methods of Safety Enhancement at Level Crossings

An example of a financial comparison of the two alternative systems, based on Indian Railways data, is provided in Table 2.2 below (KRCL, 2009). The two alternative systems are:

1. A manually operated full width barrier system, with block signal and flashing road warning lights; and

2. A train-activated full width barrier system, with a block signal, flashing road warning lights, and an obstruction detector connected to the block signal.

It is important that exactly the same level of protection should be provided by the systems being compared, so that the comparison is on a strict like-for-like basis. For this reason, it is necessary to equip the automatic system with an obstruction detector, activated by an optical sensor which will send a signal indication of the presence of any type of obstruction on the level crossing – to which the train driver may respond before the train reaches the level crossing. In the case of the manually operated barrier system, the Gateman has the function of an obstruction detector and is able to provide the signal warning to the train driver.
Table 2.2: Financial Comparison of Manual and Automatic Barrier Systems

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cost of Manual Barrier Installation</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>Capital Cost - lifting barrier with flashing light and block signal</td>
<td>38500</td>
</tr>
<tr>
<td>(ii)</td>
<td>Present Annual Value of (i) [15 year life; 12% discount rate]</td>
<td>5667</td>
</tr>
<tr>
<td>(iii)</td>
<td>Annual staffing cost</td>
<td>5862</td>
</tr>
<tr>
<td>(iv)</td>
<td>Annual Maintenance Cost (assume 10% of staffing cost)</td>
<td>568</td>
</tr>
<tr>
<td>(v)</td>
<td>Total Annual Cost</td>
<td>11917</td>
</tr>
<tr>
<td>B</td>
<td>Cost of Automatic Barrier Installation</td>
<td></td>
</tr>
<tr>
<td>(vi)</td>
<td>Capital Cost - Automatic Lifting Barrier with flashing Light &amp; Block Signal</td>
<td></td>
</tr>
<tr>
<td>(vii)</td>
<td>- Optical Sensor Obstruction Detector</td>
<td>81600</td>
</tr>
<tr>
<td>(viii)</td>
<td>Sub-total</td>
<td>135500</td>
</tr>
<tr>
<td>(ix)</td>
<td>Present Annual Value of (viii) [15 years life; 12% discount rate]</td>
<td>19395</td>
</tr>
<tr>
<td>(x)</td>
<td>Annual Opening &amp; Maintenance Cost (assume 2 x maint. cost of manual system)</td>
<td></td>
</tr>
<tr>
<td>(xi)</td>
<td>Total Annual Cost</td>
<td>21031</td>
</tr>
<tr>
<td>C</td>
<td>Net Cost Advantage for Manual Installation</td>
<td>9114</td>
</tr>
</tbody>
</table>

**Source:** KRCL, 2009

This example shows that a manual barrier system has a substantial cost advantage over an automatic barrier system, provided that it can provide the same level of safe operation as the automatic system. Clearly, the need to incorporate an obstruction detector in the automatic barrier installation reduces the cost effectiveness of this alternative by a substantial margin. However, the very low cost of labor in this example from India also contributes significantly to the cost effectiveness of the manual barrier system, since labor rates would have to be expanded by a factor of nearly 2.6 to equate the overall costs of the two systems.
CHAPTER-3

SAFETY STATUS OF LEVEL CROSSINGS IN DHAKA CITY

3.1 Locations and Classifications of Level Crossings

3.1.1 Authorized/Unauthorized Level Crossings

Among 42 level crossings between Jurine to Abdullahpur, 29 level crossings are of authorized type and 13 crossings are of unauthorized. The authorized level crossings has constructed for the requirements of various organizations and maintained by Bangladesh Railway. In case of unauthorized level crossings the crossing road has constructed by other agencies and declared unauthorized by Bangladesh Railway.

Table 3.1: Details of Authorized Level Crossings

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Level Crossing Gate No. &amp; Locations</th>
<th>Class</th>
<th>Kilometer</th>
<th>Stations at Both Ends</th>
<th>No of Duty Man</th>
<th>Maintained by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E/6 Jurine</td>
<td>Special</td>
<td>324 (6-7)</td>
<td>Fatulla-Gandaria</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>2</td>
<td>E/7 Saidabad</td>
<td>Special</td>
<td>321/13-14</td>
<td>Gandaria-Dhaka</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>3</td>
<td>T/8 Shamibag</td>
<td>B</td>
<td>321/7-8</td>
<td>Gandaria-Dhaka</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>4</td>
<td>T/9 Gopibag</td>
<td>B</td>
<td>320/14-15</td>
<td>Gandaria-Dhaka</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>5</td>
<td>T/9-A Komlapur</td>
<td>B</td>
<td>320/6-7</td>
<td>Gandaria-Dhaka</td>
<td>2</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>6</td>
<td>T/9-B (I .C. D.)</td>
<td>B</td>
<td>320/6-8</td>
<td>Gandaria-Dhaka</td>
<td>9</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>7</td>
<td>T/11 Khigaon</td>
<td>Special</td>
<td>318/8-9</td>
<td>Dhaka-Tejgaon</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>8</td>
<td>E/12 Malibag</td>
<td>C</td>
<td>317/0-1</td>
<td>Dhaka-Tejgaon</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td></td>
<td>Train Number</td>
<td>Type</td>
<td>Departure Code</td>
<td>Arrival Code</td>
<td>Stations</td>
<td>Railway</td>
</tr>
<tr>
<td>---</td>
<td>--------------</td>
<td>------</td>
<td>----------------</td>
<td>---------------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>9</td>
<td>E/13 Rampura</td>
<td>Special</td>
<td>316/13-14</td>
<td>Dhaka-Tejgaon</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>10</td>
<td>E/14 Wireless</td>
<td>A</td>
<td>316/7-8</td>
<td>Dhaka-Tejgaon</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>11</td>
<td>E/15 Boro Mogbazar</td>
<td>B</td>
<td>314/14-15</td>
<td>Dhaka-Tejgaon</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>12</td>
<td>E/16 Mogbazar</td>
<td>Special</td>
<td>315/12-13</td>
<td>Dhaka-Tejgaon</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>13</td>
<td>E/16 A F.D.C</td>
<td>Special</td>
<td>315/6-7</td>
<td>Dhaka-Tejgaon</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>14</td>
<td>T/17 Tejgaon</td>
<td>Special</td>
<td>314/10-11</td>
<td>Dhaka-Tejgaon</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>15</td>
<td>E/20 Nakhalpara</td>
<td>B</td>
<td>312/15-313/1</td>
<td>Tejgaon-Banani</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>16</td>
<td>E/21 Mohakhali</td>
<td>Special</td>
<td>311/13-14</td>
<td>Tejgaon-Banani</td>
<td>8</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>17</td>
<td>E/21 A Shoinik Club</td>
<td>A</td>
<td>310/8-9</td>
<td>Tejgaon-Banani</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>18</td>
<td>E/21 B Banani</td>
<td>B</td>
<td>310/5-6</td>
<td>Tejgaon-Banani</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>19</td>
<td>E/22 Staff Road</td>
<td>Special</td>
<td>308/7-8</td>
<td>Banani-Dhaka Cant.</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>20</td>
<td>E/23 A Progoti Shoroni</td>
<td>Special</td>
<td>306/8-9</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>21</td>
<td>E/22 A Sheora</td>
<td>C</td>
<td>306/15 307/1</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>22</td>
<td>E/23 B Khilkhet</td>
<td>A</td>
<td>305/9-10</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>23</td>
<td>E/23 Kaola</td>
<td>A</td>
<td>303/7-8</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>24</td>
<td>E/23 C Ashkona</td>
<td>Special</td>
<td>303/7-8</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>6</td>
<td>Bangladesh Railway</td>
</tr>
<tr>
<td>25</td>
<td>T/23D Koshaiibari</td>
<td>A</td>
<td>303/7-8</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>3</td>
<td>Bangladesh Railway</td>
</tr>
</tbody>
</table>
Table 3.2: Details of Unauthorized Level Crossings from Jurine to Abdullahpur

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Level Crossing Gate No. &amp; Locations</th>
<th>Kilometer</th>
<th>Stations at Both Ends</th>
<th>Nature of Road</th>
<th>By whom the road was constructed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Between Narayanganj-Dhaka</td>
<td>323/13-14</td>
<td>Fatulla-Gandaria</td>
<td>Carpeting</td>
<td>Local Government</td>
</tr>
<tr>
<td>2</td>
<td>Between Narayanganj-Dhaka</td>
<td>322/15-16</td>
<td>Fatulla-Gandaria</td>
<td>Paved</td>
<td>Local Government</td>
</tr>
<tr>
<td>3</td>
<td>Between Dhaka-Tongi</td>
<td>306/3-4</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>Paved</td>
<td>Local Government</td>
</tr>
<tr>
<td>4</td>
<td>Between Dhaka-Tongi</td>
<td>305/2-3</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>Carpeting</td>
<td>Local Government</td>
</tr>
<tr>
<td>5</td>
<td>Between Dhaka-Tongi</td>
<td>304/4-5</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>Paved</td>
<td>Local Government</td>
</tr>
<tr>
<td>6</td>
<td>Between Dhaka-Tongi</td>
<td>304/14-15</td>
<td>Dhaka Cant.-B. Bandar</td>
<td>Carpeting</td>
<td>Dhaka City Corporation</td>
</tr>
<tr>
<td>7</td>
<td>Between Dhaka-Tongi</td>
<td>301/-10</td>
<td>B. Bandar-Tongi</td>
<td>Unpaved</td>
<td>Dhaka City Corporation</td>
</tr>
<tr>
<td>8</td>
<td>Between Dhaka-Tongi</td>
<td>301/7-8</td>
<td>B. Bandar-Tongi</td>
<td>Unpaved</td>
<td>Local People</td>
</tr>
<tr>
<td>9</td>
<td>Between Dhaka-Tongi</td>
<td>301/5-6</td>
<td>B. Bandar-Tongi</td>
<td>Brick</td>
<td>Local People</td>
</tr>
</tbody>
</table>

Source: Bangladesh Railway, 2008
<table>
<thead>
<tr>
<th></th>
<th>Between Dhaka-Tongi</th>
<th>301/3-4</th>
<th>B. Bandar-Tongi</th>
<th>Brick</th>
<th>Local People</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Between Dhaka-Tongi</td>
<td>301/2-3</td>
<td>B. Bandar-Tongi</td>
<td>Unpaved</td>
<td>Local People</td>
</tr>
<tr>
<td>11</td>
<td>Between Dhaka-Tongi</td>
<td>300/9-10</td>
<td>B. Bandar-Tongi</td>
<td>Unpaved</td>
<td>Dakkhin Khan Union Parishad</td>
</tr>
<tr>
<td>12</td>
<td>Between Dhaka-Tongi</td>
<td>299/12-13</td>
<td>B. Bandar-Tongi</td>
<td>Unpaved</td>
<td>Local People</td>
</tr>
</tbody>
</table>

*Source: Bangladesh Railway, 2008*

From table 3.1, the authorized level crossings are divided into 4 classes i.e. Special class, Class “A”, Class “B”, and Class “C” shown in figure 3.1 below.

![Figure 3.1: Different Classes of Authorized Level Crossings in the Section of Jurine to Abdullahpur](image)

3.1.2 Locations

Level crossings are built at various locations depending on development of road network in Dhaka city. The constructions of level crossings are reactive plane instead of proactive. Name and geographic locations of level crossings can be shown as under:
Table 3.3: Global Locations of Level Crossings

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Name of Level Crossings</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Juraine Level Crossing</td>
<td>23°41'36.59&quot;N</td>
<td>90°26'3.79&quot;E</td>
</tr>
<tr>
<td>2</td>
<td>Saidabad Level Crossing</td>
<td>23°42'52.49&quot;N</td>
<td>90°25'30.43&quot;E</td>
</tr>
<tr>
<td>3</td>
<td>Shamibag Level Crossing</td>
<td>23°43'4.25&quot;N</td>
<td>90°25'36.01&quot;E</td>
</tr>
<tr>
<td>4</td>
<td>Gopibag Level Crossing</td>
<td>23°43'13.27&quot;N</td>
<td>90°25'38.33&quot;E</td>
</tr>
<tr>
<td>5</td>
<td>Kamalapur</td>
<td>23°43'30.37&quot;N</td>
<td>90°25'37.70&quot;E</td>
</tr>
<tr>
<td>6</td>
<td>ICD</td>
<td>23°43'38.52&quot;N</td>
<td>90°25'37.20&quot;E</td>
</tr>
<tr>
<td>7</td>
<td>Khilgaon Level Crossing</td>
<td>23°44'39.13&quot;N</td>
<td>90°25'35.20&quot;E</td>
</tr>
<tr>
<td>8</td>
<td>Malibag Level Crossing</td>
<td>23°44'58.55&quot;N</td>
<td>90°24'45.67&quot;E</td>
</tr>
<tr>
<td>9</td>
<td>Rampura Level Crossing</td>
<td>23°44'57.82&quot;N</td>
<td>90°24'50.63&quot;E</td>
</tr>
<tr>
<td>10</td>
<td>Wireless Road Level Crossing</td>
<td>23°45'00.55&quot;N</td>
<td>90°24'31.63&quot;E</td>
</tr>
<tr>
<td>11</td>
<td>Boro Mogbazar Level Crossing</td>
<td>23°45'2.99&quot;N</td>
<td>90°24'13.08&quot;E</td>
</tr>
<tr>
<td>12</td>
<td>Mogbazar Level Crossing</td>
<td>23°45'03.74&quot;N</td>
<td>90°24'07.74&quot;E</td>
</tr>
<tr>
<td>13</td>
<td>FDC Level Crossing</td>
<td>23°45'05.87&quot;N</td>
<td>90°23'52.88&quot;E</td>
</tr>
<tr>
<td>14</td>
<td>Tejgaon Level Crossing</td>
<td>23°45'22.20&quot;N</td>
<td>90°23'39.27&quot;E</td>
</tr>
<tr>
<td>15</td>
<td>Nakhalpara Level Crossing</td>
<td>23°46'14.24&quot;N</td>
<td>90°23'47.86&quot;E</td>
</tr>
<tr>
<td>16</td>
<td>Mohakhali Level Crossing</td>
<td>23°46'42.09&quot;N</td>
<td>90°23'52.17&quot;E</td>
</tr>
<tr>
<td>17</td>
<td>Shoinik Club Level Crossing</td>
<td>23°47'25.74&quot;N</td>
<td>90°23'59.25&quot;E</td>
</tr>
<tr>
<td>18</td>
<td>Banani Level Crossing</td>
<td>23°48'10.94&quot;N</td>
<td>90°24'6.60&quot;E</td>
</tr>
<tr>
<td>19</td>
<td>Staff Road Level Crossing</td>
<td>23 48 39.08 N</td>
<td>90 24 13.65 E</td>
</tr>
<tr>
<td>20</td>
<td>Progoti Sharani Level Crossing</td>
<td>23°49'16.95&quot;N</td>
<td>90°25'9.21&quot;E</td>
</tr>
<tr>
<td>21</td>
<td>Sheora Level Crossing</td>
<td>23°49'9.86&quot;N</td>
<td>90°24'59.14&quot;E</td>
</tr>
<tr>
<td>22</td>
<td>Khilkhet Level Crossing</td>
<td>23°49'43.85&quot;N</td>
<td>90°25'12.89&quot;E</td>
</tr>
<tr>
<td></td>
<td>Location</td>
<td>Latitude</td>
<td>Longitude</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>23</td>
<td>Kaola Level Crossing</td>
<td>23°49'24.57&quot;N</td>
<td>90°25'13.93&quot;E</td>
</tr>
<tr>
<td>24</td>
<td>Ashkona_Hazicamp Level Crossing</td>
<td>23°51' 2.83 N</td>
<td>90°24 33.9 E</td>
</tr>
<tr>
<td>25</td>
<td>Kosaibari Level Crossing</td>
<td>23°51'28.37&quot;N</td>
<td>90°24'22.92&quot;E</td>
</tr>
<tr>
<td>26</td>
<td>Azampur Level Crossing</td>
<td>23°52'3.40&quot;N</td>
<td>90°24'22.02&quot;E</td>
</tr>
<tr>
<td>27</td>
<td>F J Market Level Crossing</td>
<td>23°52'25.19&quot;N</td>
<td>90°24'21.41&quot;E</td>
</tr>
<tr>
<td>28</td>
<td>Ja up Abdullahpur Level crossing</td>
<td>23°52'35.32&quot;N</td>
<td>90°24'21.41&quot;E</td>
</tr>
<tr>
<td>29</td>
<td>Ja down Abdullahpur Level crossing</td>
<td>23°52'50.07&quot;N</td>
<td>90°24'22.69&quot;E</td>
</tr>
</tbody>
</table>

Unauthorized Level Crossings

<table>
<thead>
<tr>
<th></th>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Between Narayanganj-Dhaka</td>
<td>23°41'58.57&quot;N</td>
<td>90°25'48.41&quot;E</td>
</tr>
<tr>
<td>2</td>
<td>Between Narayanganj-Dhaka</td>
<td>23°42'18.19&quot;N</td>
<td>90°25'37.29&quot;E</td>
</tr>
<tr>
<td>3</td>
<td>Between Dhaka-Tongi</td>
<td>23°49'58.32&quot;N</td>
<td>90°25'10.82&quot;E</td>
</tr>
<tr>
<td>4</td>
<td>Between Dhaka-Tongi</td>
<td>23°50'8.62&quot;N</td>
<td>90°25'8.85&quot;E</td>
</tr>
<tr>
<td>5</td>
<td>Between Dhaka-Tongi</td>
<td>23°50'14.18&quot;N</td>
<td>90°25'7.58&quot;E</td>
</tr>
<tr>
<td>6</td>
<td>Between Dhaka-Tongi</td>
<td>23°50'47.76&quot;N</td>
<td>90°24'45.97&quot;E</td>
</tr>
<tr>
<td>7</td>
<td>Between Dhaka-Tongi</td>
<td>23°47'39.28&quot;N</td>
<td>90°24'1.34&quot;E</td>
</tr>
<tr>
<td>8</td>
<td>Between Dhaka-Tongi</td>
<td>23°50'25.41&quot;N</td>
<td>90°25'3.25&quot;E</td>
</tr>
<tr>
<td>9</td>
<td>Between Dhaka-Tongi</td>
<td>23°51'58.78&quot;N</td>
<td>90°24'22.08&quot;E</td>
</tr>
<tr>
<td>10</td>
<td>Between Dhaka-Tongi</td>
<td>23°51'47.47&quot;N</td>
<td>90°24'22.29&quot;E</td>
</tr>
<tr>
<td>11</td>
<td>Between Dhaka-Tongi</td>
<td>23°52'12.03&quot;N</td>
<td>90°24'21.80&quot;E</td>
</tr>
<tr>
<td>12</td>
<td>Between Dhaka-Tongi</td>
<td>23°52'19.66&quot;N</td>
<td>90°24'21.46&quot;E</td>
</tr>
<tr>
<td>13</td>
<td>Between Dhaka-Tongi</td>
<td>23°52'49.63&quot;N</td>
<td>90°24'20.37&quot;E</td>
</tr>
</tbody>
</table>
3.1.3 Intersecting Road Type

The level crossings from above mentioned section are associated with major and minor roads. 20 level crossings are associated with major roads and others are with minor roads. The images are as under:

Level Crossings with Major Roads:

1. Jurine Level Crossing
2. Saidabad Level Crossing
3. & 4. Kamlapur & ICD Level crossing
4. Khilgaon Level Crossing
5. Malibag Level crossing
6. Tejgaon Level Crossing
8. Tejgaon Level Crossing

9. Mohakhali Level Crosssing

10. Shoinik Club Level crossing

11. Progoti Sharoni Level Crossing

12. Staff Road Level Crossing

13. Sheora Level crossing
14. Khilkhet Level Crossing

15. Ashkona Level crossing

16. Azampur Level Crossing

17. Koshai bar Level Crossing

18. Abdullahpur Level crossing (Down)

19. Wireless gate Level crossing
20. FDC Level Crossing

Level Crossings with Minor Road:

1. Abdullahpur Level crossing (UP)
2. F J Market Level Crossing
3. Kaola Level Crossing
4. Banani Level Crossing
5. NakhalPara Level crossing

6. Boro Mogbazar Level Crossing

7. Shamibug Level Crossing

8. Rampura Level Crossing

9. Gopibag Level crossing

10. Between Fatulla to Gendaria

11. Between Fatulla to Gendaria

12. Between Dhaka to Tongi
13. Between Dhaka to Tongi
14. Between Dhaka to Tongi

15. Between Dhaka Cant. to Tongi
16. Between Dhaka to Tongi

17. Between Dhaka to Tongi
18. Between Dhaka to Tongi
19. Between Dhaka to Tongi
20. Between Dhaka to Tongi

21. Between Dhaka to Tongi
22. Between Dhaka to Tongi
Figure 3.2: Layout Plan of 20 Level Crossings Associated with Major Roads
The interpretation of authorized-unauthorized level crossings associated with major and minor road types can be presented as under:

Authorized 29 level crossings between Jurine to Abdullahpur are approached with 19 major roads and 10 minor roads. On the other hand the 2 unauthorized level crossings are associated with major roads and the rest 11 unauthorized crossing are with minor roads.

3.2 Accident Records

The total no. of railway accidents in Dhaka railway division from 2009 to 2010 is 246. Railway accidents in Dhaka city are found to be 34 (Shown in table 3.4 and figure 3.4). The no. of accidents at level crossings in Dhaka city is 18. The percentage of level crossing accidents over railway accidents in Dhaka city is 53% (Shown in figure 3.2). Table 3.1 shows the details of railway accidents in Dhaka city.
<table>
<thead>
<tr>
<th>S No.</th>
<th>Date</th>
<th>Section/Station</th>
<th>Train No.</th>
<th>Short Description</th>
<th>Cause of Accident</th>
<th>Responsible Person/Division</th>
<th>Punishment</th>
<th>Injured</th>
<th>Death</th>
<th>Block Time</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12/1/2009</td>
<td>Dhaka Airport-Dhaka Cantonmen 1</td>
<td>Tejgaon Shuttle</td>
<td>Derailment of all wheels of empty wagon No. 100058</td>
<td>Sudden control of speed</td>
<td>Mr. Ansar Ali M M</td>
<td>Notice form “A”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15/01/2009</td>
<td>Dhaka</td>
<td>Rrk of 10 down</td>
<td>Derailment of luggage van no. 3521</td>
<td>The head of switch rail was broken the point was not set corRakety</td>
<td>Engineering Section and Mr. Firoz Alam (P Man), Mr. Khalilur Rahman (P Man)</td>
<td>Notice form “A”</td>
<td></td>
<td></td>
<td>1/00</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10/2/2009</td>
<td>Dhaka Airport</td>
<td>759</td>
<td>Side collision of train no. 759 and luggage van no. 3525 at airport station</td>
<td>Jumping of fouling mark of train 759 up</td>
<td>Mr. Rafiq Uddin (LM, Rahatol), Mr. Kamruzzaman Patowary (AUM, Rahatol)</td>
<td>Notice form “A”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12/3/2009</td>
<td>Tongi (RM 287/8-9)</td>
<td>722</td>
<td>Violation of outer and home signal of Tongi Station by M M M</td>
<td>Violation of Signal</td>
<td>Mr. Bajlure Rahman (A F, Dhaka), Mr. Lokman (P Man), Mr. Tajul (P man), Mr. Salam (Pman)</td>
<td>Notice form “A”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>30/03/2009</td>
<td>Dhaka Cant.-Dhaka Airport (RM 360/4-5)</td>
<td>39 UP</td>
<td>Collision between a covered van (Dhaka-Metro Tha 14-1038) at level crossing (Gate-E 20 C)</td>
<td>The violation of Motor Act</td>
<td>Driver of covered van</td>
<td>Authorized Level Crossing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>28/03/2009</td>
<td>Dhaka</td>
<td>222</td>
<td>Derailment of Coach no. 817 (4 Wheels) and W F C No. 7673 (6 Wheels)</td>
<td>Blocking of 2nd line</td>
<td>Mr. Bajlure Rahman (A F, Dhaka), Mr. Lokman (P Man), Mr. Tajul (P man), Mr. Salam (Pman)</td>
<td>Notice form “A”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1/4/2009</td>
<td>Dhaka Shuntin g Engine No.-9</td>
<td>Derailment of 4 wheel at Dhaka Station</td>
<td>Careless handling of Shunting</td>
<td>Mr. Jahangir Hossain (SL M)</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>26/04/2009</td>
<td>Dhaka</td>
<td>810</td>
<td>Derailment of all wheels of MISUE No. 80003 and 80028</td>
<td>the point was not set corRakety</td>
<td>Mr. Haidar Ali (P Man), Mr. Salam (Pman)</td>
<td>4/05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>30/04/2009</td>
<td>Dhaka</td>
<td>754</td>
<td>Derailment of Train (Engine No.-6409)</td>
<td>Crossing of dangerous Shunt signal</td>
<td>Mr. Shawkat Ali (UM), Mr. Raj Uddin (A L M)</td>
<td>2/10</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>7/5/2009</td>
<td>Dhaka</td>
<td>9 Up</td>
<td>Collision between a Microbus (Dhaka-Metro) at 11-0793) train 5 up at level crossing (Gate-T 11)</td>
<td>The violation of Motor Act</td>
<td>The driver of minibus</td>
<td>Authorized Level Crossing</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Location</td>
<td>No. of Carriage</td>
<td>Details</td>
<td>Violation</td>
<td>Offender</td>
<td>Remarks</td>
<td></td>
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<tr>
<td>11</td>
<td>17/05/2009</td>
<td>Dhaka Cant, Tejgaon</td>
<td>10 Down</td>
<td>Collision between a Private car (Dhaka-Metro Kha -11-5983) and Shurmma mail (Engine No.-2322) at level crossing (Gate E/22)</td>
<td>The violation of Motor Act</td>
<td>Approved Level Crossing</td>
<td>Authorized Level Crossing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>8/6/2009</td>
<td>Tongi (KM 298/7)</td>
<td>12 Up</td>
<td>Collision between a Public Tampoo (Dhaka-Metro Tha -01-0552) and train no 12Shurmma mail (Engine No.-2322) at level crossing (Gate T/24)</td>
<td>The violation of Motor Act, The driver of Tampoo</td>
<td>Authorized Level Crossing</td>
<td>Authorized Level Crossing</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13</td>
<td>12/6/2009</td>
<td>Tongi-Dhaka Airport</td>
<td>801</td>
<td>Putting due to breaking of Buffer Shang of Train Engine no.-2018 and BFCT No.-92038</td>
<td>Material Failure</td>
<td>The supplier of Buffer shang</td>
<td>Authorized Level Crossing</td>
<td></td>
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</tr>
<tr>
<td>14</td>
<td>17/06/2009</td>
<td>Dhaka (KM 316/8-9)</td>
<td>745 Up</td>
<td>Collision between a Public Bus (Dhaka-Metro Ja -11-2608) and train (train no. 745 UP) at level crossing (Gate E/16, Special Class)</td>
<td>The violation of Motor Act</td>
<td>Bus driver</td>
<td>Authorized Level Crossing</td>
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<tr>
<td>15</td>
<td>22/06/2009</td>
<td>Dhaka</td>
<td>39 Up and 721 Down</td>
<td>Headon Collision of two train at dhaka Station yard</td>
<td>Not followed PLC information by Train 39 no. train</td>
<td>Notice form “A”</td>
<td>Authorized Level Crossing</td>
<td></td>
<td></td>
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<tr>
<td>16</td>
<td>26/07/2009</td>
<td>Tejgaon - Dhaka</td>
<td>710 Down</td>
<td>Collision between a Mishuk (Dhaka-Metro Ta -11-1309) and train (Engine no. 2916) at level crossing (Gate E/13, Special Class)</td>
<td>Mishuk Driver</td>
<td>Authorized Level Crossing</td>
<td>Authorized Level Crossing</td>
<td></td>
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<tr>
<td>17</td>
<td>5/7/2009</td>
<td>Dhaka</td>
<td>The Rake of 736 Down</td>
<td>Derailment of all wheels of W E no. 8502</td>
<td>Returning without knowing whether the line 5 is clear or not instead of line no. 6</td>
<td>Notice form “A”</td>
<td>200</td>
<td></td>
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</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Location</td>
<td>Event Type</td>
<td>Description</td>
<td>Violation of Act</td>
<td>Driver/Operator</td>
<td>Unauthorised Level Crossing</td>
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<tr>
<td>18</td>
<td>18/08/2009</td>
<td>Tejgaon-Dhaka Airport (KM 307/7-8)</td>
<td>721 Up</td>
<td>Collision between a private car (Dhaka-Metro Tha -00-0354) and train (Engine no. 2904) at unauthorized level crossing</td>
<td>The violation of Motor Act</td>
<td>Driver of private car</td>
<td>Unauthorized Level Crossing</td>
<td></td>
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<tr>
<td>19</td>
<td>17/08/2009</td>
<td>Dhaka</td>
<td>51 Up</td>
<td>Derailment of 2 wheels of S/L/R no. 2895</td>
<td>The point no. 161 was not set and lock perfectly</td>
<td>Signal division</td>
<td></td>
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<tr>
<td>20</td>
<td>3/9/2009</td>
<td>Tejgaon-Dhaka (KM 316/4-5)</td>
<td>11 Down</td>
<td>Collision between a private car (Dhaka-Metro Ga -17-8920) and train (Engine no. 2503) at level crossing (Gate no. E/16)</td>
<td>The violation of Motor Act</td>
<td>Driver of private car</td>
<td>Authorized Level Crossing</td>
<td></td>
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<tr>
<td>21</td>
<td>13/09/2009</td>
<td>Dhaka cant., Tejgaon (KM 311/6-7)</td>
<td>340 Down</td>
<td>Collision between a public truck (Comilla Ta 6989) and train (Engine No.-2704)</td>
<td>During turning maneuver, the wheel of truck locked with resting its tail within rail track</td>
<td>Train driver</td>
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<tr>
<td>22</td>
<td>13/10/2009</td>
<td>Tejgaon (KM 315/7-8)</td>
<td>704 Down</td>
<td>Hitting of private car (Dhaka Metro ga 14-4093 with train at Level crossing (gate-T/17)</td>
<td>Violation of Motor Act</td>
<td>The car driver</td>
<td>Authorized Level Crossing</td>
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<tr>
<td>23</td>
<td>20/10/2009</td>
<td>Tongi Dhaka Airport (KM 290/3-4)</td>
<td>708 down</td>
<td>The collision between a rail roller and train engine (Engine no.- 2610) at unauthorized level crossing</td>
<td>Violation of Motor Act</td>
<td>Mr. Ismail Hossain (Babu), Commissioner of Tongi Municipality</td>
<td>Unauthorized Level Crossing</td>
<td></td>
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<tr>
<td>24</td>
<td>2/11/2009</td>
<td>Tongi Project/Sp ial-1</td>
<td>Derailment of four wheel of Engine No.-2316</td>
<td>Due to auto-normalization of newly introduced interlocking system</td>
<td>Contractor</td>
<td>205</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Location</td>
<td>Incident Details</td>
<td>Violation of Act</td>
<td>Responsible Party/Officer</td>
<td>Notice Form</td>
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<tr>
<td>25</td>
<td>13/11/2009</td>
<td>Gendaria</td>
<td>The collision between Private car (Dhaka Metro-Cha 51-7482) and the Engine of Train (No.-2508) at Unauthorized Level Crossing</td>
<td>The violation of Motor act</td>
<td>The car driver</td>
<td>Unauthorized Level Crossing</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>26</td>
<td>11/12/2009</td>
<td>Dhaka Cantonment</td>
<td>The collision between Microbus (Dhaka Metro-Cha 11-7412) and the Train (No.-6408) at level crossing gate no. T/22</td>
<td>The violation of Motor act and negligence of everybody engaged at the crossing</td>
<td>Mr. Bulai Anast (SM), Mr. Sirajul Islam (PM), Mr. A. Rashid (LM), Mr. Bashba (Temporary Gateman), Mr. Shahjahan (Temporary Gateman)</td>
<td>Authorized Level Crossing</td>
<td></td>
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</tr>
<tr>
<td>27</td>
<td>24/01/2010</td>
<td>Dhaka Cantonment</td>
<td>Derailment of engine no. 2607 (6 wheels) and engine no. 5309 (4 wheels)</td>
<td>Under investigation</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>28</td>
<td>19/02/2010</td>
<td>Tejgaon-Dhaka cant.</td>
<td>Collision between a private car (Dhaka Metro-Cha-13-6222) and 9 Up at level crossing gate no.-E/21</td>
<td>The violation of Motor Act</td>
<td>Driver of private car</td>
<td>2/30</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>29</td>
<td>27/03/2010</td>
<td>Tongi-Airport</td>
<td>Collision between a Pickup Van and engine no-2509 of 710 down at level crossing gate no.-E/23</td>
<td>The violation of Motor Act</td>
<td>Pickup driver</td>
<td>Authorized Level Crossing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>11/6/2010</td>
<td>Tejgaon-Dhaka (KM 310/5-7)</td>
<td>Head-on collision between 44 down train (engine no.-2516) and train 738 (engine no. -2508) at level crossing gate no.-T/11</td>
<td>Violation of down outer signal by L. S</td>
<td>Mr. nurul Haq (LS), Zakir Hossain (ALS), A. Motahedd (Guard), Mahmudul Haq (CSS), Gias Uddin (AYF), Delwar Hossain (SLS)</td>
<td>1/50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>13/03/2010</td>
<td>Tejgaon-Dhaka Cant.</td>
<td>Collision between a private car (Dhakametro-Kha-12-3507) and engine no. 2915 of 757 Up at level crossing gate no.-X/50</td>
<td>The violation of Motor Act</td>
<td>Driver of private car</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note: The notice forms mentioned are the standard forms used for such incidents, and the reference code "A" typically indicates a formal notification or report.
From above table, the most accidents are at the level crossings which are approached by major roads. The special type and class A type level crossings are involved with accidents. 17% accidents are at unauthorized level crossings from 2009 to 2010.

### 3.3 Analysis of Accident Data

The no. of level crossing accidents in Dhaka division is 34 and total no. of railway accidents in Dhaka division is 246. In Dhaka city the no. of railway accidents and accidents at level crossings are 34 and 18 respectively (Bangladesh Railway, 2010).

#### 3.3.1 Accident Statistics:

a) Accident-Prone Months

Table 3.5: The Accidents at Level crossings and the Month of accidents

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Month of Level Crossing Accidents</th>
<th>No. of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>February</td>
<td>01</td>
</tr>
<tr>
<td>2</td>
<td>March</td>
<td>02</td>
</tr>
<tr>
<td>3</td>
<td>May</td>
<td>02</td>
</tr>
<tr>
<td>4</td>
<td>June</td>
<td>04</td>
</tr>
</tbody>
</table>
From the level crossing accidents data in Dhaka city from 2009 to 2010, in the month of June maximum accidents are observed. Furthermore in the month of January and April there is no accidents happened during last couple of years.

b) Type of Level Crossing Gates and Accidents

Table 3.6: Accidents and Level Crossing Gate Types

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Type of Level Crossings</th>
<th>No. of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Special Class</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>Class A</td>
<td>02</td>
</tr>
<tr>
<td>3</td>
<td>Class B</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Class C</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Unauthorized</td>
<td>03</td>
</tr>
</tbody>
</table>

The special type of level crossings is vulnerable gate from accident point of view. Unauthorized level crossings within Dhaka city are also accident-prone. From the table 3.3, there is no accident record during 2009 to 2010 at crossing type B and C.
c) Affected Vehicles in Level Crossing Accidents

Table 3.7: Vehicle Involvements at Level Crossing Accidents

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Affected Vehicles in Level Crossing Accidents</th>
<th>No. of Accidents</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Private car</td>
<td>08</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Microbus</td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Public Bus</td>
<td>02</td>
<td>Commercial Vehicle</td>
</tr>
<tr>
<td>4</td>
<td>Covered Van</td>
<td>01</td>
<td>Commercial Vehicle</td>
</tr>
<tr>
<td>5</td>
<td>Road Roller</td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mishuk</td>
<td>01</td>
<td>Commercial Vehicle</td>
</tr>
<tr>
<td>7</td>
<td>Public Tampoos</td>
<td>01</td>
<td>Commercial Vehicle</td>
</tr>
<tr>
<td>8</td>
<td>Train</td>
<td>01</td>
<td>Commercial Vehicle</td>
</tr>
<tr>
<td>9</td>
<td>Pickup Van</td>
<td>01</td>
<td>Commercial Vehicle</td>
</tr>
</tbody>
</table>

Mostly affected vehicles are seen to be involved in accidents at level crossings is private car. Even road roller was also affected. From the table 3.5 affected commercial vehicles are 6 out of nine categories of vehicles.

d) Accident Related Train Direction

Table 3.8: Level Crossing Accident Involved Train Directions in Dhaka City

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Direction of Train</th>
<th>No. of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UP</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Down</td>
<td>07</td>
</tr>
</tbody>
</table>
Maximum accident involving trains are of up in direction of movement. The percentage of up trains involved in level crossing accidents is more than 60%.

Figure 3.4: Pin Diagram of Level Crossings (Authorized) Accidents in Dhaka City
Figure 3.5: Stick Diagram of Accidents at Level Crossings (Authorized) In Dhaka City
Table 3.9: Responsible Persons and Punishment

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Date of Accidents</th>
<th>Gate No.</th>
<th>Responsible Person/Division</th>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30/03/2009</td>
<td>Gate-E/23 C</td>
<td>Driver of covered van</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7/5/2009</td>
<td>Gate-T/11</td>
<td>The driver of minibus</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>17/05/2009</td>
<td>Gate-E/22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>8/6/2009</td>
<td>Gate-T/24</td>
<td>The driver of Tampoo</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>17/06/2009</td>
<td>Gate-E/16</td>
<td>Bus driver</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>26/07/2009</td>
<td>Gate-E/13</td>
<td>Mishuk Driver</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>18/08/2009</td>
<td>Unauthorized level crossing</td>
<td>Driver of private car</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3/9/2009</td>
<td>Gate no. E/16</td>
<td>Driver of private car</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>13/10/2009</td>
<td>gate-T/17</td>
<td>The car driver</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>20/10/2009</td>
<td>Unauthorized level crossing</td>
<td>Mr. Ismail Hossain (Babu), Commissioner of Tongi Municipality</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>13/11/2009</td>
<td>Unauthorized Level Crossing</td>
<td>The car driver</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>11/12/2009</td>
<td>gate no. T/22</td>
<td>Mr. Belaet Hossain (SM), Mr. Sirajul Islam (P Man), Mr. A, Rashid (LM, Ishwardi), Mr. Badsha (Temporary Gateman), Mr. Shahjahan (Temporary Gateman)</td>
<td>Notice form &quot;A&quot;</td>
</tr>
<tr>
<td>13</td>
<td>19/02/2010</td>
<td>gate no. E/21A</td>
<td>Driver of private car</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>27/03/2010</td>
<td>gate no. E/23</td>
<td>Pickup driver</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>11/6/2010</td>
<td>gate no. T/11</td>
<td>Mr. nurul Haq (LS), Zakir Hossain (ALS), A. Motalleb (Guard), Mahmudul Haq (CSS), Gius Uddin (AYF), Delwar Hossain (SL)</td>
<td>Notice form &quot;A&quot;</td>
</tr>
<tr>
<td>16</td>
<td>13/06/2010</td>
<td>gate no. T/50</td>
<td>Driver of private car</td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Date of Accidents</td>
<td>Gate No.</td>
<td>Responsible Person/Division</td>
<td>Punishment</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------</td>
<td>---------------</td>
<td>--------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>17</td>
<td>7/8/2010</td>
<td>gate no. - T/11</td>
<td>Driver of private car</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>29/09/2010</td>
<td>Gate E/7</td>
<td>Bus driver</td>
<td></td>
</tr>
</tbody>
</table>

### 3.3.2 No of Accident Statistics at Different Level Crossings

The percentage of level crossing accidents in Dhaka division over all types of railway accidents is of 14% where as in the section of Jurine to Abdullahpur is 53% (in figure 3.4 & 3.5 respectively) in the last couple of years.

![Total Accidents Vs Level Crossing Accidents in Dhaka Division](image.png)

Figure 3.6: Railway Accidents in Dhaka Division
Accidents at level crossings in Dhaka city is 4 times more than that of Dhaka division. Such ratio of level crossing accidents in Dhaka city and Dhaka Division is due to high traffic and population density exists in Dhaka city, poor management of level crossings, poor geometry at level crossings, poor level of service, inefficient road network etc. The majority of railway accidents in the section of Jurine to Abdullahpur are at level crossings. 17% level crossing accidents in this route are at unauthorized level crossing. Unauthorized level crossings are not maintained by BR. As per BR enquiry, the public road vehicles are hundred percent responsible for level crossing accidents in last two years, the warning and control system also has a roll in occurring these accidents.

In the year of 2009 and 2010, 18 level crossing accidents happened between Jurine to Abdullahpur section. Most of the accident involved level crossings are associated with road of major roads. “Special” class level crossings are most vulnerable. Thirteen level crossing accidents out of fifteen in Dhaka city have been occurred at special class level crossings. The numbers of authorized “special” class level crossings are eleven within the study area (Table 3.3). The manpower who were engaged for these gates are not skilled and the number of peoples are also not equal.
From the accident data at level crossings in Dhaka city, 4 level crossings are accident-prone. These level crossings are:

1. Khilgaon Level crossing (T/11)
2. Mogbazar level crossing (E/16)
3. Tejgaon Level crossing and (T/17)
4. Staff road Level crossing (E/22)

The detail analysis is needed to be carried out to the 4 level crossings for identifying the causes of accidents and related safety problems.
4.1 Introduction

The analysis of level crossing data related to safety issues in Dhaka city shows four level crossings are found to be the most accident-prone. Accidents were commenced repeatedly during the last couple of years at these level crossings. These level crossings are:

A. Khilgaon Level crossing
B. Mogbazar Level Crossing
C. Tejgaon Level Crossing and
D. Staff Road Level Crossing

Field survey was carried out to the above mentioned level crossings in order to identify the safety problems such as the existing warning system, the substandard geometric parameters, and the approaching road condition, the status of engaged people etc. In this chapter these information are presented as under.

4.2 Khilgaon Level Crossing

It is a “Special” type of level crossing of gate no. and location are T11 and 318/8-9 respectively. During the year of 2009 and 2010 three accidents are happened. The safety related information are described as under.

4.2.1 Geometric Parameters

The approaching road at the down side is straight and intersecting angle is 90° with rail track at Khilgaon level crossing (approximately). But at the upside there is a T-junction road approaches the level crossings and the length of the straight portion of road is 25 meters. The visibility of road traffic coming from the T-junction is very bad and the radii of the two sections of upside are not more than 8 meter. The distance between gate and the rail line is 4 meter.
The pier of Khilgaon flyover at the upside is creating obstruction for road traffic. The length of guard rail is 30.5 meters and the width of road is 20 meters.

### 4.2.2 Gateman/Gatekeeper:

During field visit of Khilgaon level crossing, the following information was provided by the gateman aged 58 years old as under:

<table>
<thead>
<tr>
<th>Type of Gateman</th>
<th>No. of Personnel</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent</td>
<td>05</td>
<td>Three Shifts</td>
</tr>
<tr>
<td>Temporary</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
The gatemen are not trained properly. Most of the gatemen are recruited under master role basis and their satisfaction level of job is very low. As a result the reluctance on duty may have an effect in execution of accidents at level crossings. Most of the gatemen are not well dressed regarding safety issue.

4.2.3 Pedestrian Movement and Vendors:

The pedestrian and other motorized traffic are not controlled during the restricted time. There is no fencing to control over their movement. The traffic police is also violating the barrier shown in fig. 4.3 & 4.4.

Figure 4.3 and 4.4: During the lifting Barrier road user are not controlled from risky movement

Figure 4.5: Vendors are Much Closed to the Rail Track
4.2.4 The Controlling System

There is no road marking is provided here. At this level crossing, there is no sign for warning the traffic. The total no. of gateman at this crossing is 15 for three shifts. As per Article 226-kha, there is 15 types of equipment shall be available at gate, but they don’t have this equipment (Bangladesh Railway, 1987). When the train passes the previous crossing the alarm is on automatically and it switched off after it crosses. At the time of the bell is start to ring, the gateman closes the road by lifting barrier. The gateman also shows the flag (green/red) for the train. Non-Motorized Traffic (NMT) and pedestrians often move along the level crossings during the period when the barrier is applied.

4.2.5 Traffic Moment TM Value

The total no. of road traffic at this level crossing is 73797 per day including 20651 non-motorized traffic (PADECO and BCL, 2009). The no. of train passing per day at Khilgaon level crossing is 81.

\[ TM = \text{Daily number of road vehicles} \times \text{Daily number of trains} = 5,977,557 \]

4.3 Mogbazar Level Crossing

Mogbazar level crossing is also a “Special” class level crossing and its gate no. E16. This crossing is vulnerable to accident. The features related to safety issue are illustrated as under:

4.3.1 Geometric Parameters

This level crossing associated with a major road. An earthen footpath also aligned along with the rail track. The crossing angle is 55° as shown in figure 4.6. The length of the guard rail is 29 meter. The width of road at crossing is 24 meter and the guard rail beyond the road is 2.3 meter. The perpendicular distance between the gate lodge and rail lines 5 meter. The distance of gate lodge and the nearest track is 3.5 meters.

4.3.2 Gateman/Gatekeeper

The total no. of gateman of Mogbazar level crossing is 12 (three shifts) as per the verbal statement of a gateman (23 years old). 8 gatemen are recruited under master roll basis and other 4 are of permanent staff of Bangladesh Railway.
During night time 3 peoples are provided at the level crossing which is the minimum requirement for a “Special” class level crossing.

![Figure 4.6: Mogbazar Rail Crossing](image)

### 4.3.3 Existing Safety Features

- **Unsafe Maneuvering of Vehicles:**

A large number of vehicles are taking U-turn frequently over the rail track. The straight ahead vehicles coming from opposite direction may be stopped on the rail track and may lead collision with train.

![Figure 4.6: A Microbus Taking U-turn Over the Level Crossing](image)
During field survey, the time of interval between two trains is observed as 2 minutes as figure 4.7 (a) and 4.7 (b), as a result, the U-turning vehicle can make obstruction for the straight ahead vehicle on the rail track which will cause serious accidents.

![Image of trains at level crossing](image1)

Figure 4.7 (a) and 4.7 (b): Two Trains Have Reached the Level Crossing Within 3 Minutes.

- **Signs:**

There are signs on both sides of the level crossing but cannot be visible for road user as shown in figure 4.8 (a) & (b) below.

![Image of signs at level crossing](image2)

Figure 4.8 (a) & (b): The Sign Installed But Not Making Sense for Road Users
4.3.4 Traffic Moment (TM) Value

The total no. of road traffic at this level crossing is 47422 per day including 22624 non-motorized traffic (PADECO, 2009). The total no. of train passing per day at Mogbazar level crossing is 81.

\[ TM = \text{Daily number of road vehicles} \times \text{Daily number of trains} = 3,841,182 \]

4.4 Tejgaon Level Crossing

It is a “Special” type of level crossing of gate no. T-17 and at kilometer of 314/10-11. Tejgaon level crossing is an accident-prone level crossing as per the data of Bangladesh Railway accident log book. Various features related with accidents at this level crossing are presented as under.

4.4.1 Geometric Parameters

The combination of rail track and road alignments is a critical geometry with respect to safety. Several roads are approached at the level crossings (figure 4.10). The radii of approaching roads are 1.4 and 4.8 meter. The specified minimum radius of approaching road curve is 60 meters for special class of level crossings (Table 2.1). The sight distance is fully obstructed for road users. The distance of straight portion of road in the west side of rail track is 15 meter.
4.4.2 Gateman/Gatekeeper

In three shifts 12 gatemen are engaged at Tejgaon level crossing. 4 gatemen are permanent and other 8 are recruited in master roll basis. During the conversation with gatemen, they shared their experiences (figure 4.11 below).

There is a gateman who was trained before three years. The equipment inside their room is not enough as per Bangladesh Railway guideline.
4.4.3 Road Surface and Side Friction

The surface of road at crossing is very bad shown in figure below. The maintenance of road is not carried out. The cleaning between the guard rail and rail track was not done. The surface is not plain at level crossing.

Figure 4.12: The Road Surface at Tejgaon Level crossing

Figure 4.13: The Truck Stand at Tejgaon Level Crossing

Truck stand reduces effective width of road approaching from Sat Rastar more towards level crossing. This parking of trucks also obstructed the visibility.
4.4.4 Controlling System

The sign do not making sense for warning for the road users as shown in figure 4.14 below.

![Image of Tejgaon Level Crossing Sign](image)

Figure 4.14: The Sign (Yellow Circle) at Tejgaon Level Crossing

The automatic alarming system is not working here. The telephonic messages are used for closing the road by lifting barrier. The message is transferred from adjacent two stations over telephone.

4.5 Staff Road Level Crossing

Staff road level crossing is a “Special” class level crossing and the road crossing the rail line is a very busy road. Two accidents have been recorded by Bangladesh Railway during the period from 2009 to 2010. The field survey was carried out to know the safety problems at this level crossing.

4.5.1 Geometric Features

Staff road level crossing is a skew type crossing. The width of the road is 35 meters. The length of guard rail beyond road is 1.50 meter. The intersecting angle is 24°. The rail line is of curve at crossing section. The upside station is Banani and the Down side station is Airport station. The ADT of the approaching road is 130016 (DTCB, 2010).
4.5.2 Gateman/Gatekeeper

The total numbers of gatemen at Staff road level crossing is 14. 6 persons are permanent staff and other 8 persons are in recruited as master roll basis. The gateman (in figure 4.16) who is a permanent staff of Bangladesh Railway have trained before 22 years in Chittagong for three months. Later on the do not get such type of training.
4.5.3 Controlling System

The master makes phone call when the train passed the adjacent stations (Banani & airport station). Then the bell is starting to ring. The gateman closes the road by providing lifting barrier. The road signal also provides the warning for road traffic.

4.5.4 Traffic Moment (TM) Value

The ADT at Staff road level crossing is 130016 including 3593 non-motorized traffic (DTCB, 2010). The total no. of train passing per day at Khilgaon level crossing is 81.

\[ TM = \text{Daily number of road vehicles} \times \text{Daily number of trains} = 10,531,296 \]

4.6 Conclusions

These four level crossings are vulnerable from the safety point of view. From the field survey the following conclusions can be made:

- The calculated TM values of Khilgaon, Mogbazar and Staff road level crossings are 5977557, 3841182, and 10531296 respectively. The obtained TM values are clearly indicating the immediate construction of grade separation with respect to the condition for Iran, Thailand etc. for reducing accidents. The higher TM value meant for higher collision rate.
There is no speed barrier and the sign of speed barrier at specified locations. And also violating of article 227 j of Bangladesh Railway Rules and Regulations (Bangladesh Railway, 1987)

The minimum stopping sight distance for a car of speed 40 kph is 45 meters (Brown G. 2006). The existing lengths of straight portion of road approaching at level crossing are 25 meter and 15 for Khilgaon and Tejgaon crossing respectively.

The minimum distance between gate lodge and centre line of nearest track is 6 meter for “Special” class as per BR guideline. In Khilgaon and Mogbazar level crossings this value is found to be 4 meter. 3.5 meters respectively.

The minimum number of gatekeepers at “Special” class of level crossing is 3. The maximum people at these level crossings are found to be 3 and who are not well trained.

The gateman are not trained properly. There is no training needs assessments as well as effectiveness of training as ISO 9001:2004

U-turning vehicles at Mogbazar level crossing are a risky movement which can lead accidents.

The radius of road alignment is 1.4 meter at Tejgaon level crossing. But the minimum radius of a road centerline on curved approach within 50 meter of the centerline of the railway shall be 60 meter (Bangladesh Railway, 1980).

At Tejgaon level crossing, the road surface condition is very bad and the surface at the crossing is not plane (shown in figure 4.12).

Routine work is not done at Tejgaon level crossing (No cleaning of dust between Rail track and guard rail)
CHAPTER-5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary
The study covers the railway accidents at level crossings in Dhaka city. The analysis concentrated on the rate of accidents at level crossings over all types of railway accidents, various causes of accidents at level crossings etc. The future attempts to carry out the economic analysis for the selection of measures from the alternates of safety measures around the world.

From the analysis of railway accident data of last couple of years, recommendations are made and mentioned here. This chapter describes the conclusions and recommendations based on the analysis and status of level crossings.

5.2 Conclusions
During this study, some important conclusions have been made related to data analysis and status of level crossings of railway accidents in Dhaka city.

1. The calculated TM values of Khilgaon, Mogbazar and Staff road level crossings are 5977557, 3841182, and 10531296 respectively. The obtained TM values are clearly indicating the immediate construction of grade separation with respect to the condition for Iran, Thailand etc. for reducing accidents. The higher TM values meant for higher collision rate. A lot of vehicles are entering on roads everyday in Dhaka city and increasing the AADT as well as the TM values which are increasing the accident rates at level crossings.

2. Bangladesh Railway did not mention about punishment of the responsible persons for accidents at level crossings strictly as per monthly accident report of Bangladesh Railway. The violation of motor act is an offence but the evidence of punishment of such offensive activities was not executed. It is recommended to ensure proper legislative action.
3. The huge numbers of private cars are entering on roads everyday in Dhaka city and increasing the AADT of roads approaching at level crossings. The control over vehicle ownership should be established.

4. The width of guard rail shall be greater than gate width. The other geometric features of most level crossings in Dhaka city are substandard. The visibility is bad at several level crossings in Dhaka city such as Progoti Sharoni which is not allowing enough room for safety. The skew form of level crossings i.e. the angle between road alignment and rail track is not 90°. Staff road, Mogbazar, FDC etc are such type of geometry. Skew type crossings are more risky than a right angle one from the point of safety. Poor condition of approached road to level crossing leads failure of motor vehicle brake capability. Such geometric parameters are suggested to rectify.

5. Poor maintenance of level crossing warning and protection devices is also responsible for level crossing accidents. Warning device of level crossings in Dhaka city does not work properly.

6. At some level crossings, the road surface condition is very bad and the surface at the crossing is not plane. In order to make a safety level crossing, monitoring and periodic maintenance of approaching road must be carried out.

7. Low level of public discipline and as a consequence, mass violations by vehicle drivers of the rules relating to passing of level crossing is a reason of level crossing accident. Motor vehicle driver misjudgment concerning road conditions and the approach of trains at level crossings lead to accident.

5.3 Recommendations

In accordance with the accidents at level crossings the following measures can be taken for implementation in future:

1. Grade separation of Khilgaon, Mogbazar, Tejgaon and Staff road level crossings.
2. Development of TM ranges for upgrading and installation of level crossings.

3. Ensure proper signs and signals at level crossings strictly.

4. Improvement of geometric features such as visibility, angular dimensions, road surface conditions and width etc.

5. The enrollments of law enforcing agency shall be ensured for the responsible persons such as bus/car drivers.

6. The monitoring and maintenance of level crossing safety measures by a professional body.

7. Improve reliability and Modernization of devices operating on “special” class level crossings.

8. Development of motor vehicle driver education programmes as a mandatory phenomenon.

9. Refinement and/or establishment of level crossing classification and evaluation system

10. Providing of greater priority to level crossing improvement in capital works budget

5.4 Scope for Future Studies

1. The feasibility study for installation of Transmission Based Train Control Systems (TBTC) or Advanced Train Control Systems (ATCS) at level crossings can be carried out as an advanced safety measures.

2. Analysis of railway accidents at all level crossings in Bangladesh.

3. Comparative study of level crossing safety status of Bangladesh and other country.
## Train Schedule:

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Type of Train</th>
<th>Arrival Time</th>
<th>Train No.</th>
<th>Name of Train</th>
<th>Originating Station</th>
<th>Departure Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mail &amp; Express</td>
<td>5:30</td>
<td>706</td>
<td>Ekota Express</td>
<td>Dinajpur</td>
<td>20:30</td>
</tr>
<tr>
<td>2</td>
<td>Mail &amp; Express</td>
<td>5:50</td>
<td>740</td>
<td>Upaban Express</td>
<td>Sylhet</td>
<td>22:15</td>
</tr>
<tr>
<td>3</td>
<td>Mail &amp; Express</td>
<td>6:10</td>
<td>741</td>
<td>Turna Express</td>
<td>Chittagong</td>
<td>23:00</td>
</tr>
<tr>
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<td>Mail &amp; Express</td>
<td>7:55</td>
<td>744</td>
<td>Brahmaputra</td>
<td>Bahadurabad Ghat</td>
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<td>Mail &amp; Express</td>
<td>8:20</td>
<td>746</td>
<td>Jamuna Express</td>
<td>Tarakandi</td>
<td>2:00</td>
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<td>6</td>
<td>Mail &amp; Express</td>
<td>9:00</td>
<td>725</td>
<td>Sundarban (Shuttle)</td>
<td>Khulna</td>
<td>22:00</td>
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<td>7</td>
<td>Mail &amp; Express</td>
<td>11:10</td>
<td>738</td>
<td>Egaro Sindur Provati</td>
<td>Kishoregonj</td>
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</tr>
<tr>
<td>8</td>
<td>Mail &amp; Express</td>
<td>13:00</td>
<td>701</td>
<td>Subarna Express</td>
<td>Chittagong</td>
<td>7:00</td>
</tr>
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<td>9</td>
<td>Mail &amp; Express</td>
<td>13:45</td>
<td>754</td>
<td>Silkcity (Shuttle)</td>
<td>Rajshahi</td>
<td>7:00</td>
</tr>
<tr>
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<td>Mail &amp; Express</td>
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<td>721</td>
<td>Mohanagar Provati</td>
<td>Chittagong</td>
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<td>Mail &amp; Express</td>
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<td>718</td>
<td>Joyontika Express</td>
<td>Sylhet</td>
<td>7:30</td>
</tr>
<tr>
<td>12</td>
<td>Mail &amp; Express</td>
<td>17:25</td>
<td>750</td>
<td>Egaro Sindur Godhuli</td>
<td>Kishoregonj</td>
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<td>Mail &amp; Express</td>
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<td>Dinajpur</td>
<td>8:45</td>
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<td>708</td>
<td>Tista Express</td>
<td>Bahadurabad Ghat</td>
<td>14:00</td>
</tr>
<tr>
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<td>Intercity Trains</td>
<td>20:25</td>
<td>752</td>
<td>Lalmoni Express</td>
<td>Lalmonirhat</td>
<td>10:20</td>
</tr>
<tr>
<td>16</td>
<td>Intercity Trains</td>
<td>20:45</td>
<td>711</td>
<td>Upakul Express</td>
<td>Noakhali</td>
<td>15:20</td>
</tr>
<tr>
<td>17</td>
<td>Intercity Trains</td>
<td>21:05</td>
<td>760</td>
<td>Padma (Shuttle)</td>
<td>Rajshahi</td>
<td>14:15</td>
</tr>
<tr>
<td>18</td>
<td>Intercity Trains</td>
<td>21:25</td>
<td>703</td>
<td>Mohanagar Godhuli</td>
<td>Chittagong</td>
<td>14:30</td>
</tr>
<tr>
<td>19</td>
<td>Intercity Trains</td>
<td>21:45</td>
<td>710</td>
<td>Parabat Express</td>
<td>Sylhet</td>
<td>14:45</td>
</tr>
<tr>
<td>20</td>
<td>Intercity Trains</td>
<td>22:35</td>
<td>736</td>
<td>Agnibina Express</td>
<td>Tarakandi</td>
<td>16:00</td>
</tr>
<tr>
<td>21</td>
<td>Mail &amp; Express</td>
<td>4:30</td>
<td>44</td>
<td>Mohua Express</td>
<td>Mohanganj</td>
<td>0:00</td>
</tr>
<tr>
<td>22</td>
<td>Mail &amp; Express</td>
<td>4:55</td>
<td>11</td>
<td>Dhaka Express</td>
<td>Noakhali</td>
<td>0:00</td>
</tr>
<tr>
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### Goods Train Schedule WEST ZONE

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REFERENCES


JICA , Draft Final Report of “Study on Dhaka Urban Transport Network Development (DHUTS)”, under Dhaka Transport Coordination Board (DTCB), Surveyed by Katahira & Engineers International; Oriental Consultants Co. Ltd., Mitsubishi Research Institute, Inc., March 2010


Bangladesh Railway, Summary of approved and unapproved level crossing gate in East Zone., 2008.


