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Safety Status of Level Crossings in Dhaka City

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Abstract: Traffic safety at level crossings has become a momentous issue at level crossings in Dhaka city. The operational management and control, crossing geometry, road surface conditions, and deficiencies of skilled manpower are the key issues for safety problems at level crossings. The level crossing accidents in Dhaka division is 14% of all rail related accidents and the same in Dhaka city is 53%. So the rate of level crossing accidents in Dhaka city is very high. The field data collection was also carried out at selected accident-prone level crossings. 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 in this study. Advanced controlling system has been studied to suggest for improvement of safety status. Therefore, some recommendations are suggested for improving safety status of railway level crossings in Dhaka city.

Keywords: Level Crossing, Accident Prone Level Crossing, Traffic Moment, Accidents, Bangladesh Railway.

I. INTRODUCTION

Dhaka is the capital city of Bangladesh with a population of 12.8 million [BBS, 2009] spread over an area of 320 sq. Km [JICA, 2008]. 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 nos. of these are associated with major roads and remaining 22 nos. 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). 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, understanding of the causes of accidents at level crossings is needed to view the safety scenario. This study 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.

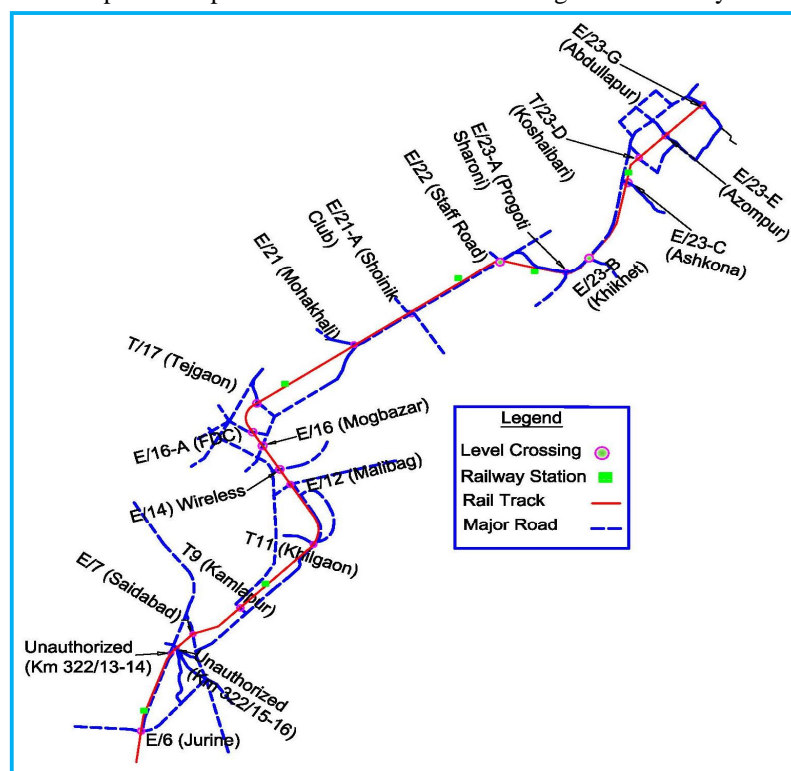


Fig.1 Layout plan of level crossings with major roads in Dhaka City

II. 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:

A. Classification of Level Crossings based on controlling system (Gupta, B. L. and Gupta, A., 2003)

- 1) Guarded/Controlled level crossing
- 2) Unguarded/Uncontrolled level crossing

B. Classification of Level Crossings Based on Number of Road Vehicle and Trains

- 1) Special
 - 2) A Class
 - 3) B Class
 - 4) C Class
 - 5) D Class
- For roads
- For cattle crossing

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.

- a) *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.
- b) *Class B Level Crossing*: This type of level crossing are on grand trunk roads.
- c) *Class C Level Crossing*: This class of level crossings are provided on un-metalled roads.
- d) *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 cattle is provided.

III. TRAFFIC THRESHOLD CRITERIA for IMPROVEMENT of LEVEL CROSSING SAFETY STATUS

Most of the region's railways apply traffic threshold criteria as a basis for determining the type of level crossing installations, assess and improve the safety status of existing level crossings. 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 \times 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).

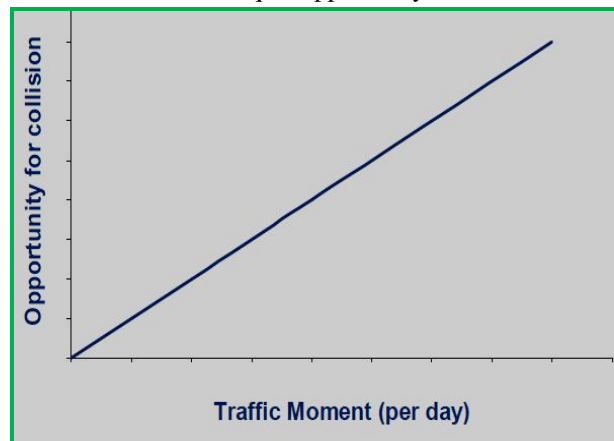


Fig. 2 Linear Model for Opportunity for Collision [UIC. 2008]

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.

IV. COLLECTION and ANALYSIS of DATA RELATED to SAFETY at LEVEL CROSSINGS

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 01 and figure 3.4-Pin Diagram). The number of accidents at level crossings in Dhaka city is 18. The percentage of level crossing accidents over railway accidents in Dhaka city is 53%. Table 3.1 shows the details of railway accidents in Dhaka city.

Table 1. Accidents Data of Dhaka City (From 2009 to 2010)

Sl No.	Date	Section/Station	Train No.	Short Description	Cause of Accident	Responsible Person/Division	Punishment	Injured	Death	Block Time	Remarks
1	12/1/2009	Dhaka Airport-Dhaka Cantonment	Tejgaon Shuttle	Derailment of all wheels of empty wagon No.-100058	Sudden control of speed	Mr. Ansar Ali L M	Notice form "A"				
2	15/01/2009	Dhaka	Rek of 10 down	Derailment of luggage van no-3521	The head of switch rail was broken the point was not set correctly	Engineering Section and Mr. Firoz Alam (P-Man), Mr. Khalilur Rahman (P-Man)	Notice form "A"			1/00	
3	10/2/2009	Dhaka Airport	759 Up/9Up	Side collision of train no. 759 and luggage van no.-3525 at airport station	Jumping of fouling mark of train 759 up/759 up	1. DGP Dhaka 2. Guard Dhaka 3. LM of Train no. 759	Notice form "A"				
4	12/3/2009	Tongi (KM 297/8-9)	722 Down	Violation of outer and home signal of Tongi Station by MLM	Violation of Signal	Mr. Rafiq Uddin (LM, Pahartoli), Mr. Kamrujjaman Patoary (ALM, Pahartoli)	Notice form "A"				
5	30/03/2009	Dhaka Cant.-Dhaka Airport (KM 360/4-5)	39 UP	Collision between a covered van (Dhaka-Metro Tha 14-1038) at level crossing (Gate-E/23 C)	The violation of Motor Act	Driver of covered van					Authorized Level Crossing
6	28/03/2009	Dhaka	222 Down	Derailment of Coach no. 817 (4 Wheels) and W F C No.-7673 (8 Wheels)	Blocking of 2nd line	Mr. Bajlur Rahman (A Y F, Dhaka), Mr. Lokman (P Man, Mr. Tajul (Pman), Mr. Salam (Pman)	Notice form "A"				
7	1/4/2009	Dhaka	Shunting Engine No.-2319	Derailment of 4 wheel at Dhaka Station	Careless handling of Shunting	Mr. Jahangir Hossain (S L M)					
8	26/04/2009	Dhaka	810	Derailment of all wheels of MBUE No.-80003 and 80026	the point was not set correctly	Mr. Haidar Ali (P Man, Mr. Salam (Pman)				4/05	
9	30/04/2009	Dhaka	754 Down	Derailment of Train (Engine No.-6409)	Crossing of dangerous Shunt signal	Mr. Shawkat Ali (LM), Mr. Riad Uddin (A L M)				2/10	
10	7/5/2009	Dhaka	9 Up	Collision between a Microbus (Dhaka-Metro ja 11-0793) train 9 up at level crossing (Gate-T/11)	The violation of Motor Act	The driver of minibus					Authorized Level Crossing
11	17/05/2009	Dhaka Cant. Tejgaon	10 Down	Collision between a Private car (Dhaka-Metro Kha -11-5983) and Shurmma mail (Engine No.-2322) at level crossing (Gate-E/22)	The violation of Motor Act						Authorized Level Crossing
12	8/6/2009	Tongi (KM 298/7)	12 Up	Collision between a Public Tampoo (Dhaka-Metro Tha -01-0552) and train no 12Shurmma mail (Engine No.-2322) at level crossing (Gate-T/24)	The violation of Motor Act	The driver of Tampoo					Authorized Level Crossing

Sl No.	Date	Section/Station	Train No.	Short Description	Cause of Accident	Responsible Person/Division	Punishment	Injured	Death	Block Time	Remarks
13	12/6/2009	Tongi-Dhaka Airport	801	putting due to breaking of Buffer Shang of Train Engine no.-2018 and BFCT No.-92038	Material Failure	The supplier of Buffer shang					
14	17/06/2009	Dhaka - Tejgaon (KM-316/8-9)	745 Up	Collision between a Public Bus (Dhaka-Metro Ja -11-2608) and train (train no. 745 UP) at level crossing (Gate-E/16, Special Class)	The violation of Motor Act	Bus driver					Authorized Level Crossing
15	22/06/2009	Dhaka	39 Up and 721 Down	Head-on Collision of two train at dhaka Station yard	Not followed PLC information by Train 39 no. train	Mr. Saiful Islam (PSM), Mr. Khademul Bashar (C A S M)	Notice form "A"	10	1	08/08	
16	26/07/2009	Tejgaon - Dhaka	710 Down	Collision between a Mishuk (Dhaka-Metro Ta -11-1309) and train (Engine no. 2916) at level crossing (Gate-E/13, Special Class)	The violation of Motor Act	Mishuk Driver		3	1		Authorized Level Crossing
17	5/7/2009	Dhaka	The Rake of 736 Down	Derailment of all wheels of W E no. 8502	Returning without knowing wheather the line 5 is clear or not instead of line no. 6	Mr. Tajul Islam (CSM) and Mr. Mijanur Rahman (SLM)	Notice form "A"			2/00	
18	18/08/2009	Tejgaon-Dhaka Airport (KM 307/7-8)	721 Up	Collision between a private car (Dhaka-Metro Tha -00-0354) and train (Engine no. 2904) at unauthorized level crossing	The violation of Motor Act	Driver of private car					Unauthorized Level Crossing
19	17/08/2009	Dhaka	51 Up	Derailment of 2 wheels of SLR no. 2895	The point no. 161 was not set and lock perfectly	Signal division					
20	3/9/2009	Tejgaon-Dhaka (KM 316/4-5)	11 down	Collision between a private car (Dhaka-Metro Ga -17-8920) and train (Engine no. 2503) at level crossing (Gate no. E/16)	The violation of Motor Act	Driver of private car					Authorized Level Crossing
21	13/09/2009	Dhaka cant.- Tejgaon (KM 311/6-7)	740 Down	Collision between a public truck (Comilla Ta 6989) and train (Engine No.-2704)	During turning maneuver, the wheel of truck locked with resting its tail within rail track	Train driver					
22	13/10/2009	Tejgaon (KM 315/7-8)	704 Down	Hitting of private car (Dhaka Metro ga 14-4093) with train at Level crossing (gate-T/17)	Violation of Motor Act	The car driver					Authorized Level Crossing
23	20/10/2009	Tongi Dhaka Airport (KM 299/3-4)	708 down	The collision between a rad rollar and train engine (Engine no.-2610) at unauthorized level crossing	Violation of Motor Act	Mr. Ismail Hossain (Babu), Commissioner of Tongi Municipality				3/10	Unauthorized Level Crossing
24	2/11/2009	Tongi	Project/Special-1	Derailment of four wheel of Engine No.-2316	Due to auto-normalization of newly introduced interlocking system	Contractor				2/05	

Sl No.	Date	Section/Station	Train No.	Short Description	Cause of Accident	Responsible Person/Division	Punishment	Injured	Death	Block Time	Remarks
25	13/11/2009	Gendaria KM 324/6-7	261 UP	The collision between Private car (Dhaka Metro-Cha 51-7682) and the Engine of Train (No.-2508) at Unauthorized Level Crossing	The violation of Motor act	The car driver					Unauthorized Level Crossing
26	11/12/2009	Dhaka Cantonment	765 Up	The collision between Microbus (Dhaka Metro-Cha 11-7412) and the Train (No.-6404) at level crossing gate no. T/22	The violation of Motor act and neglegency of everybody engaged at the crossing	Mr. Belaet Hossain (SM), Mr. Sirajul Islam (P Man), Mr. A. Rashid (LM, Ishwardi), Mr. Badsha (Temporary Gateman), Mr. Shahjahan (Temporary Gateman)	Notice form "A"	3 no.			Authorized Level Crossing
27	24/01/2010	Dhaka cantonment (KM 307/5-6)	709	Derailment of engine no. 2607 (6 wheels) and engine no. 5309 (4 wheels)	Under investigation						
28	19/02/2010	Tejgaon-Dhaka cant.	9 Up	Collision between a private car (Dhaka Metro Cha-13-6222) and 9 Up at level crossing gate no.- E/21 A	The violation of Motor Act	Driver of private car				2/30	Authorized Level Crossing
29	27/03/2010	Tongi - Airport	710 Down	Collision between a Pickup Van and engine no-2709 of 710 down at level crossing gate no.- E/23	The violation of Motor Act	Pickup driver					Authorized Level Crossing
30	11/6/2010	Tejgaon-Dhaka (KM 319/5-7)	44 Down	Head-on collosion between 44 down train (engine no.-2516) and train 738 (engine no.-2508) at level crossing gate no.- T/11	Violation of down outer signal by L S	Mr. nurul Haq (LS), Zakir Hossain (ALS), A. Motalleb (Guard), Mahmudul Haq (CSS), Gius Uddin (AYF), Delwar Hossain (SLS)	Notice form "A"			1/50	Authorized Level Crossing
31	13/03/2010	tejgaon -Dhaka Cant.	757 Up	Collision between a private car (Dhakametro Kha-12-3507) and engine no-2915 of 757 Up at level crossing gate no.- T/50	The violation of Motor Act	Driver of private car		2		45 minute	Authorized Level Crossing
32	7/8/2010	Dhaka-Tejgaon	735 Up	Collision between a private car (Dhakametro Ga-14-9123) and engine no-2804 of 757 Up at level crossing gate no.- T/11	The violation of Motor Act	Driver of private car					Authorized Level Crossing
33	27/08/2010	Dhaka Airport-Tongi (KM 300/4-5)	CJ Cover emty Special	Derailment of all wheels of cover emty special up train (emty wagon)	Material Failure	Mechanical unit					
34	29/09/2010	Gandaria - Dhaka (Km 322/8-9)	231 Up	The collision between Public Bus (Narayanganj Bo-11-0039) and Train no.231 (Engine no.-2315) at Level crossing Gate E/7 (Special)	The violation of Motor Act	Bus driver					Authorized Level Crossing

Source: Bangladesh Railway, 2010

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.

V. DATA ANALYSIS

A. Crossing Vs. Intersecting Road

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.

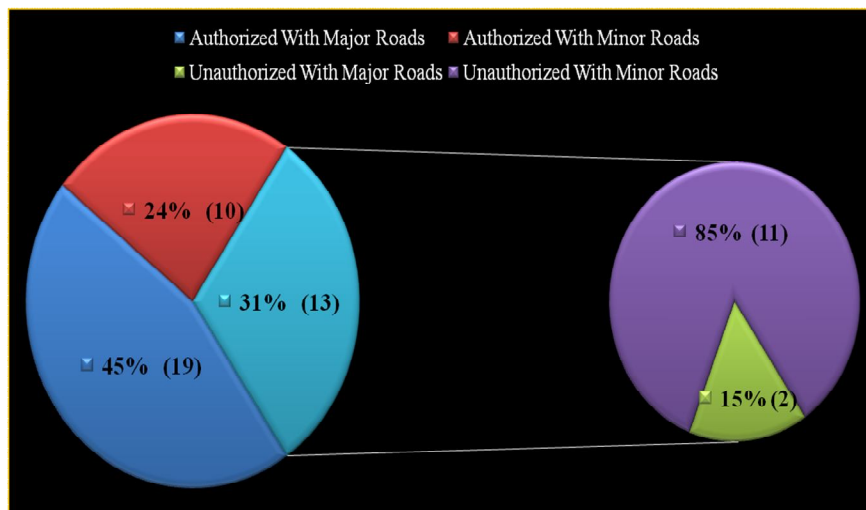


Fig. 3 Interpretation of Level Crossings Type and Intersecting Road Type

In case of unauthorized level crossings the crossing road has constructed by other agencies and declared unauthorized by Bangladesh Railway. The interpretation of authorized-unauthorized level crossings associated with major and minor road types can be presented as figure 3.

B. Level Crossing Accidents at Dhaka Division and Dhaka City

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 2 & 3 respectively) in the last couple of years.

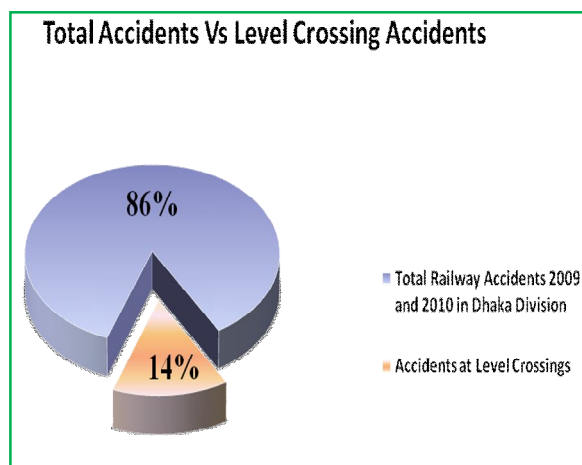


Fig. 4 Railway Accidents in Dhaka Division

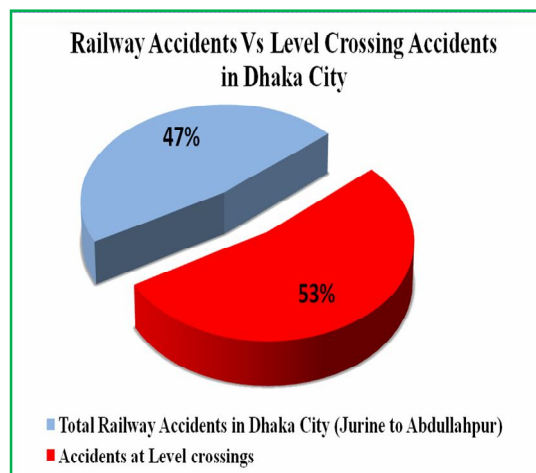


Fig. 5 Total Railway Accidents except at Level Crossings and Accidents at Level Crossings in Dhaka City

Accidents at level crossings in Dhaka city is 4 times more than that of Dhaka division. The majority of railway accidents in the section of Jurine to Abdullahpur level crossings.

C. Accident-Prone Months

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.

Table 2. The Accidents at Level crossings and the Month of accidents

Sl No.	Month of Level Crossing Accidents	No. of Accidents
1	February	01
2	March	02
3	May	02
4	June	04
5	July	01
6	August	02
7	September	02
8	October	02
9	November	01
10	December	01

D. Type of Level Crossing Gates and Accidents

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 2.2, there is no accident record during 2009 to 2010 at crossing type B and C.

Table 4 Affected Vehicles Type in Accidents

Sl. No.	Affected Vehicles in Level Crossing Accidents	No. of Accidents	Affected vehicle Class
1	Private car	08	Private Vehicle
2	Microbus	02	Private Vehicle
3	Public Bus	02	Commercial
4	Covered Van	01	Commercial
5	Road Roller	01	
6	Mishuk	01	Commercial
7	Public Tampoo	01	Commercial
8	Train	01	Commercial
9	Pickup Van	01	Commercial

Table 3 Accidents and Gate Types

1 No.	Type of Level Crossings	No. of Accidents
1	Special Class	13
2	Class A	02
3	Class B	0
4	Class C	0
5	Unauthorized	03

E. Affected Vehicles in Level Crossing Accidents

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 2.3, affected commercial vehicles are 6 out of nine categories of vehicles.

F. Accident Related Train Direction

Maximum accident involved trains are of up in direction of movement shown in Table 2.4 below. The percentage of up trains involved in level crossing accidents is more than 60%.

Table 5 Accidents Involved Train Directions at Level Crossings

Sl No.	Direction of Train	No. of Accidents
1	UP	11
2	Down	07

G. Liability of Level Crossing Accidents

Table 6 Responsible Persons and Punishments

Sl. No.	Date of Accidents	Gate No.	Responsible Person/Division	Punishment
1	30/03/2009	Gate-E/23 C	Driver of covered van	
2	7/5/2009	Gate-T/11	The driver of minibus	
3	17/05/2009	Gate-E/22		
4	8/6/2009	Gate-T/24	The driver of Tampoo	
5	17/06/2009	Gate-E/16	Bus driver	
6	26/07/2009	Gate-E/13	Mishuk Driver	
7	18/08/2009	unauthorized level crossing	Driver of private car	
8	3/9/2009	Gate no. E/16	Driver of private car	
9	13/10/2009	gate-T/17	The car driver	
10	20/10/2009	unauthorized level crossing	Mr. Ismail Hossain (Babu), Commissionar of Tongi Municipality	
11	13/11/2009	Unauthorized Level Crossing	The car driver	
12	11/12/2009	Gate no. T/22	Mr. Belaet Hossain (SM), Mr. Sirajul Islam (P Man), Mr. A, Rashid (LM,	Notice form "A"
13	19/02/2010	gate no.-E/21A	Driver of private car	
14	27/03/2010	gate no.-E/23	Pickup driver	
15	11/6/2010	gate no.-T/11	Mr. nurul Haq (LS), Zakir Hossain	Notice form
16	13/06/2010	gate no.-T/50	Driver of private car	
17	7/8/2010	gate no.-T/11	Driver of private car	
18	29/09/2010	Gate E/7	Bus driver	

VI. MAJOR CAUSES of LEVEL CROSSINGS ACCIDENTS in DHAKA CITY

In order to find out the probable causes of accidents at crossings, we have to carry out the detail investigations of individual level crossings including side visits. From analysis of level crossing accident data, the major cause of level crossing accident data can be summarized as under:

- 1) *Legislative Action:* There is no official evidence to ensure punishment or any effective legislative action against the responsible persons of level crossing accidents. It results to obstruct the evaluation process of level crossings. Accordingly, accidents at level crossings are increasing significantly without any modification and development of existing vulnerable crossings.
- 2) *Unauthorized Level Crossing:* 17% level crossing accidents in this route are associated at unauthorized level crossing. Unauthorized level crossings are not maintained by BR. 17% level crossing accidents in this route are at unauthorized level crossing.
- 3) *Gate and Crossing Type:* 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 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. The manpower who were engaged to maintain and control of these gates are of unskilled and inadequate.
- 4) *Miscellaneous Causes:* 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. 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.

VII. ACCIDENT-PRONE LEVEL CROSSINGS IN DHAKA CITY

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 year of 2009 and 2010 at these level crossings. These level crossings are as under:

- 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)

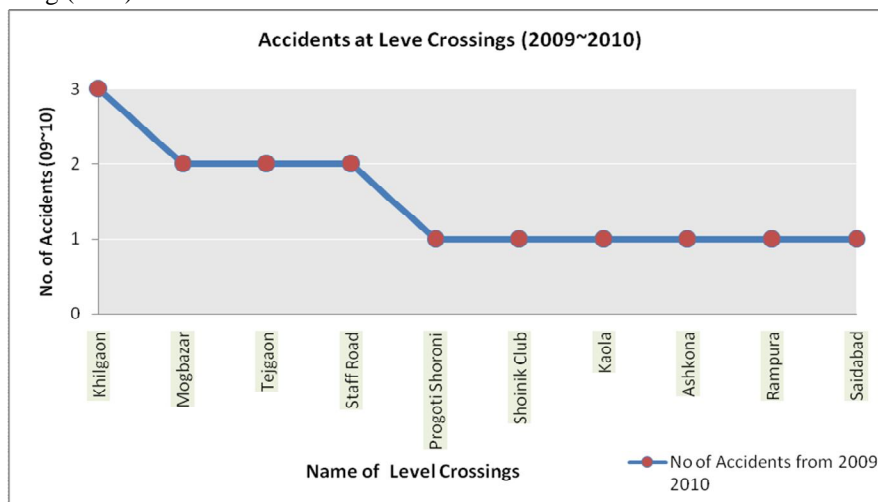


Fig. 6 Accidents vs. Level Crossing Gates

VIII. CONCLUSIONS AND RECOMMENDATIONS

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

A. Conclusions

During this study, some important conclusions can be made related to data analysis and status of level crossings of railway accidents in Dhaka city.

- 1) As there is no established method to assess the existing safety status at level crossings in Bangladesh, it is strongly recommended to establish the Traffic Moment (TM) ranges first to improve the safety at level crossings in Dhaka city as well as in Bangladesh. The accident prone crossings as defined in this study can be the pilot cases for determining the TM ranges.
- 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.
- 3) 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 is not allowing enough room for safety. Poor condition of approached road to level crossing leads failure of motor vehicle brake capability. Such geometric parameters are suggested to rectify
- 4) The huge numbers of private cars are entering on roads every day in Dhaka city and increasing the AADT of roads approaching at level crossings. The control over vehicle ownership should be established.
- 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) 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.

B. Recommendations

The study covers the railway accidents at level crossings in Dhaka city. The analysis concentrated on the rate of accidents at level crossings over the all types of railway accidents, various causes of accidents at level crossings etc. The future attempts to carry out the detail study for the selected accident-prone level crossings. From the analysis of railway accident data of the year of 2009~2010, recommendations are made and mentioned here.

- 1) As the TM values are the clearly indication of the immediate action for reducing accidents at level crossings, it is very essential to establish an accepted range of the value as early as possible.
- 2) Detail study of accident-prone level crossings in Dhaka city through the establishment of TM value.
- 3) Improvement of geometric features at crossings in this city such as visibility, angular dimensions, road surface conditions and width etc.
- 4) Ensure proper signs and signals at level crossings shall be maintained strictly.
- 5) The monitoring and maintenance of level crossing safety measures by a professional body.
- 6) In order to make a safe level crossing, monitoring and periodic maintenance of approaching road shall be carried out.
- 7) Providing greater priority to level crossing improvement in capital works budget as per established TM ranges.
- 8) Development of motor vehicle driver education programs as a mandatory phenomenon.
- 9) Providing of greater priority to level crossing improvement in capital works budget

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