Multi-Stakeholder Action Plan:

“Road Safety Remedial Measures for Gurugram City Road Network”
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New Delhi, India, August 2018
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1. INTRODUCTION

Every year, road traffic related crashes claim the lives of 1.25 million individuals and leave 50 million others seriously injured or disabled (WHO 2015). Based on these numbers, road traffic related injuries are ranked among the leading causes of death in the world and are the primary cause of death for young people aged 15-29. There is also an economic burden associated with improper road safety. Road traffic injuries and deaths have far-reaching repercussions that affect the household, the employer, and the country as a whole. As such, road safety represents a challenge to sustainable development as well as a threat to global health.

The 17 Sustainable Development Goals agreed upon by the United Nations General Assembly in September of 2015 include road safety among one of their 169 targets. SDG 3 covers topics related to health and wellness, with SDG 3.6 specifically seeking to “halve the number of global deaths and injuries from road traffic accidents” by the year 2020. To go along with this objective, the United Nations has also declared 2011 – 2020 as the Decade for Action on Road Safety aimed at improving road safety around the world.

In April 2018 during its seventy-fourth session, the United Nations General Assembly approved by consensus the 12 voluntary global performance targets for road safety risk factors and service delivery mechanisms and encouraged Member States to take steps, following good practices, towards achieving the voluntary global performance targets for road safety.

Furthermore, Member States were invited to develop and implement national road safety plans, and to consider adopting comprehensive legislation in line with the Global Plan for the Decade of Action for Road Safety 2011–2020, with a view to meeting the target of increasing the percentage of countries with comprehensive legislation on key risk factors, including the non-use of seat belts, child restraints and helmets, the drinking of alcohol and driving, and speeding, from 15 per cent to at least 50 per cent by 2020, and to consider implementing appropriate, effective and evidence- and/or science-based legislation on other risk factors related to distracted or impaired driving.

At this time, the General Assembly also requested the United Nations system, to support Member States, upon their request, in applying voluntary global performance targets for road safety when appropriate and invited all relevant stakeholders, international organizations, development banks and funding agencies, foundations, professional associations and private sector companies to scale up funding to support the implementation of measures required to meet the voluntary global performance targets.

In this context, the United Nations Institute for Training and Research (UNITAR), through its Partnership for Action and alongside public and private sector partners, is committed to both strengthening the capacities of government officials and key stakeholders to improve road safety and supporting the implementation of concrete actions that help achieve road safety related targets.

As part of UNITAR’s efforts to contribute to advance Road Safety in India, with the support of AB InBev and in collaboration with CSIR - Central Road Research Institute, “this Multi-Stakeholder Action Plan: Road Safety Remedial Measures for Gurugram City Road Network” has been developed with the aim to provide actions stakeholders may take to improve road safety and supporting the implementation of concrete actions that help achieve road safety related targets.

UNITAR thanks the “Safer Roads for Gurugram Initiative” launched in India in December 2017 as an effort led by AB InBev in collaboration with the Government of Haryana. The Initiative is also supported by public and private sector partners, including the CSIR-Central Road Research Institute (CSIR-CRRI), DLF Foundation, Apollo Tyres, the Indian Road Safety Campaign (IRSC) the Safe Road Foundation (SRF), All India Motor Transport Congress (AIMTC), Ola Cabs, Pepsi Co., and the All India Institute of Medical Sciences (AIIMS) who have contributed in sharing their expertise, providing recommendations to this Plan and contributing to identify practical solutions that can lead to road safety improvements.

The Multi-Stakeholder Action Plan: Road Safety Remedial Measures for Gurugram City Road Network is presented during the Road Safety High Level Conference in Gurugram, India along with other tools that aim to contribute to road safety management, including:

The “Road Safety Learning and Partnership Platform” is a collaborative initiative that aims to support countries to design and implement systematic, recurrent and results-oriented road safety learning.

The Road Safety Data Dashboard for Gurugram
Data has been analyzed and a data dashboard tool has been developed based on the First Information Reports (FIR) with the objective being to capture relevant factors identified in road crashes. The data dashboard will be updated on a quarterly basis and will serve as a tool for government authorities to target road safety actions.
The state of Haryana is ranked the 13th highest in terms of total number of road crashes by numbering 11,234 constituting a share of 2.34 per cent in the overall share of road crashes in the country during the year 2016. At the same time, the state has occupied 12th position in terms of number of road victims / fatalities in the country contributing to 5024 road deaths and thus accounting for 3.33 percent during the same year. Figure 1.1 depicts the profile of state / union territory-wise road crashes whereas Figure 1.2 presents the state / union territory-wise road fatalities during the year 2016. On the other hand, though the state is ranked 12th.highest in terms of road fatalities, the overall road crash severity i.e. Road Crash deaths per 100 Road crashes in the state of Haryana in the state continues to hover around 45 (as shown in Figure 1.3) during the last 4 years which is much above the national average of 29.7.

1.1 Study Area

![Figure 1.1: Total Number of Crashes State/Union Territory wise Fatalities in 2016](image)
A close look at all the reported figures (vide Figure 1.1 to 1.3) reveals that the number of fatalities and road crashes coupled with increasing trends in road crash severity in the state is a major cause of concern.
1.2 Study Area: Gurugram City

Gurgaon (recently renamed as Gurugram) is a city located in the state of Haryana which is also part of the National Capital Region (NCR) of India and located about 32 Kilometers southwest of New Delhi. As per the Census-2011, the population of Gurugram is 876,824. Since the city has witnessed rapid urbanization, it has become a leading financial and industrial hub accounting for the third-highest per capita income in the country. The economic growth of the erstwhile Gurgaon city dates back to the 1980s when the leading Indian automobile manufacturer M/s. Maruti Suzuki India Limited established their first manufacturing plant. Today, Gurugram is housing more than 500 commercial establishments encompassing multinational and registered offices of major corporate giants in the country. Over the last decade, the city has witnessed steady increase in traffic coupled with increase in road crashes due to various reasons. Figure 1.4 shows the trend of road crashes, persons killed and injured in Gurugram city.

![Figure 1.4: Total Number of Crashes/Persons Killed/Persons injured in Gurugram wise Fatalities in 2009-2017](image)

It can be inferred from Figure 1.4 that during the year 2016 and 2017, the total number of road crashes increased marginally from 1201 to 1214, whereas the number of fatalities increased from 420 to 481 with minor reduction in the number of injured persons from 1213 to 1189. This implies that a long term road safety investment measures is required with the proper background study for the various road safety measures and monitoring at periodic intervals coupled with the need for suitable interventions. In the absence of proper monitoring, it limits seriously road safety performance.
2 OBJECTIVES AND SCOPE OF THE STUDY

2.1 Objectives

- To Suggest the remedial measures for ten identified black spot locations
- Monitoring the implemented actions (6 months) from the date of implementation

2.2 Scope of the Study

The study includes Road Safety Measures on identified ten black spots:

i. Suggested remedial measures

a) Engineering measures:

Comprising of geometric improvements of black spots locations, adequacy of traffic sign boards, speed reducing measures (Traffic calming measures), traffic buffer Zones, relocation of bus stops, sight distance clearances, enhancing the lighting etc...).

b) Education and Motor driving skills campaigns: Under this CSIR-CRRI will render expert advises to the concerned organization targeting different groups.

c) Enforcement: Expert advice on the measures to focuses on the areas needed for the Enforcement point of view.

ii. Monitoring the implemented actions for a period of Six months from the implementation

Mainly the monitoring is based on the accidents reduction data collected after the implementation.

Table 2.1: Top black spot locations based on assessment conducted by consulting firm Falconi

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Location Name</th>
<th>No.of. Fatalities</th>
<th>Gender</th>
<th>Age</th>
<th>Type of Vehicle</th>
<th>Time Period</th>
<th>Day</th>
<th>Year.Month</th>
<th>Type of accident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NH-8 - Iffico Chowk</td>
<td>22</td>
<td>M (14)</td>
<td>41</td>
<td>Motorcyclist (5)</td>
<td>00:00 - 05:59</td>
<td>Friday (5)</td>
<td>2017.09 (3)</td>
<td>Rear-End Collision (7)</td>
</tr>
<tr>
<td>2</td>
<td>NH-8 - Hero Honda Chowk</td>
<td>18</td>
<td>M (15)</td>
<td>24, 27, 32</td>
<td>Motorcyclist (7)</td>
<td>06:00 - 11:59</td>
<td>Saturday (6)</td>
<td>2017.03 (3)</td>
<td>Rear-End Collision (6)</td>
</tr>
<tr>
<td>3</td>
<td>NH-8 - Bilaspur Chowk</td>
<td>15</td>
<td>M (7)</td>
<td>20</td>
<td>Pedestrian (6)</td>
<td>00:00 - 11:59</td>
<td>Saturday (6)</td>
<td>2016.06 (2)</td>
<td>Rear-End Collision (5)</td>
</tr>
<tr>
<td>4</td>
<td>NH-8 - Rajiv Chowk</td>
<td>13</td>
<td>M (7) F (1)</td>
<td>24</td>
<td>Pedestrian (5)</td>
<td>00:00 - 11:59</td>
<td>Monday (4)</td>
<td>2017.12 (2)</td>
<td>Run over (6)</td>
</tr>
<tr>
<td>5</td>
<td>NH-8 - Sidhrawali</td>
<td>13</td>
<td>M (7) F (2)</td>
<td>24, 29, 45, 54 (5)</td>
<td>Driver (2)</td>
<td>06:00 - 11:59</td>
<td>Thursday (4)</td>
<td>2017.02 (2)</td>
<td>Run over (5)</td>
</tr>
<tr>
<td>6</td>
<td>NH-8 - Narsinghpur</td>
<td>12</td>
<td>M (6) F (3)</td>
<td>33, 37, 65 (3)</td>
<td>Motorcyclist (2)</td>
<td>00:00 - 11:59</td>
<td>Monday (4)</td>
<td>2016.09 (2)</td>
<td>Rear-End Collision (4)</td>
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<tr>
<td>7</td>
<td>NH-8 - Binola Flyover</td>
<td>11</td>
<td>M (7) F (1)</td>
<td>46</td>
<td>Pedestrian (5)</td>
<td>06:00 - 11:59</td>
<td>Monday (5)</td>
<td>2017.10 (2)</td>
<td>Rear-End Collision (3)</td>
</tr>
<tr>
<td>8</td>
<td>NH-8 - Signatory Tower</td>
<td>11</td>
<td>M (6) F (1)</td>
<td>26, 55 (2)</td>
<td>Pedestrian (3)</td>
<td>00:00 - 11:59</td>
<td>Wednesday (6)</td>
<td>2016.04 (4)</td>
<td>Rear-End Collision (2)</td>
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<td>NH-8 - Shankar Chowk</td>
<td>8</td>
<td>M (4)</td>
<td>-</td>
<td>Driver (2) Pedestrian (1)</td>
<td>06:00 - 11:59</td>
<td>Saturday (2)</td>
<td>2016.02 (3)</td>
<td>Run over (2)</td>
</tr>
<tr>
<td>10</td>
<td>NH-8 - Ambience mall</td>
<td>8</td>
<td>M (7)</td>
<td>20</td>
<td>Pedestrian (4) Rickshaw (2)</td>
<td>06:00 - 11:59</td>
<td>Saturday (2)</td>
<td>2016.07 (4)</td>
<td>Run over (1)</td>
</tr>
<tr>
<td>11</td>
<td>Golf course road</td>
<td>10</td>
<td>M (4)</td>
<td>-</td>
<td>Pedestrian (2)</td>
<td>06:00 - 11:59</td>
<td>Saturday (2)</td>
<td>2016.10 (2)</td>
<td>Run over (1)</td>
</tr>
<tr>
<td>12</td>
<td>Service Road</td>
<td>8</td>
<td>M (7)</td>
<td>30, 36 (2)</td>
<td>Pedestrian (2)</td>
<td>06:00 - 11:59</td>
<td>Tuesday (2)</td>
<td>2016.01 (1)</td>
<td>Rear-End Collision (1)</td>
</tr>
<tr>
<td>13</td>
<td>Sector 37</td>
<td>5</td>
<td>M (2)</td>
<td>-</td>
<td>Other (1)</td>
<td>06:00 - 11:59</td>
<td>Tuesday (2)</td>
<td>2016.05 (2)</td>
<td>Rear-End Collision (1)</td>
</tr>
<tr>
<td>14</td>
<td>Ambedkar Chowk</td>
<td>4</td>
<td>M (2)</td>
<td>20</td>
<td>Motorcyclist (1)</td>
<td>12:00 - 17:59</td>
<td>Monday (2)</td>
<td>2016.04 (1)</td>
<td>Side collision (1)</td>
</tr>
<tr>
<td>15</td>
<td>DLF Phase II</td>
<td>4</td>
<td>M (2)</td>
<td>21, 25 (1)</td>
<td>Pedestrian (1)</td>
<td>12:00 - 17:59</td>
<td>Monday (2)</td>
<td>2016.01 (2)</td>
<td>Side collision (1)</td>
</tr>
<tr>
<td>16</td>
<td>Huda City Center</td>
<td>3</td>
<td>M (3)</td>
<td>-</td>
<td>Cyclist (2)</td>
<td>12:00 - 17:59</td>
<td>Monday (3)</td>
<td>2016.07 (1)</td>
<td>Rear-End Collision (1)</td>
</tr>
</tbody>
</table>

M: (Male) F: (Female)
3. METHODOLOGY

3.1 Methodology Adopted

To carry out the above study, the methodology followed is presented in Figure 3.1.

i) The information relating to the safety measures implemented on the selected roads was furnished by Consulting Firm Falconi.

ii) Subsequently, a detailed Road Safety Audit (RSA) was conducted by a 2 member expert team of CSIR - CRRI to assess the overall safety features on the identified locations. As part of the above, field visits was made by walking along the study locations at the identified black spots, if any to appreciate other physical and environmental features that required special attention from the point of view of safety.

iii) Suggesting the Road Safety Remedial Measures based on the field visits conducted

iv) Monitoring /Assessment of the effectiveness of the road safety measures implemented

Based on the above each location assessment and pitfalls if any identified through the RSA conducted on the locations, appropriate additional recommendations / remedial measures for the identified safety deficiencies have been suggested along with the action plan for implementation.
4 ROAD SAFETY AUDIT AND REMEDIAL MEASURES OF SELECTED TOP BLACK SPOT LOCATIONS

The CSIR-CRRI study team visited the IFFCO Chowk Intersection and DLF Cyber City Chowk intersection on 11th July 2018. The study team comprising of Dr Errampalli Madhu, Principal Scientist, and Dr Kayitha Ravinder, Principal Scientist, Transportation Planning & Environment Division of CSIR - CRRI conducted the Road Safety Audit (RSA) of IFFCO Chowk Intersection and DLF Cyber City Chowk intersection on 11th July 2018. The findings emerging from the above Road Safety Audit is discussed in detail in the succeeding sections.

It may be noted RSA findings are applicable for both directions of travel i.e. Left Hand Side (LHS) and Right Hand Side (RHS) of the divided carriageways especially in the case of recommendation in respect of Visual Aids in the form of Traffic Control Devices as well as Crash Protection measures. The RSA recommendations are grouped into the following categories and presented in next sections:

i) Road signs
ii) Road markings
iii) Road studs
iv) Object Hazard Markers (OHM)
v) Median Nose treatment at the intersections and median gaps
vi) Pedestrian Facilities
vii) Placement of Separation Barriers/Dividers
viii) Safety Tips to School/residents/inhabitants along the corridors
ix) Safety Measures at Intersections, Median Gaps and Access roads
x) Other Important points emerged during the site visit

From the RSA conducted, the study team felt the a good to fair amount of Road Safety measures were implemented to enhance the safety on roads, however at many locations the maintenance after the implementation of the measures were not take up to upkeep the road safety measures the details were further discussed below:
4.1 ROAD SAFETY AUDIT AND REMEDIAL MEASURES AT IFFCO CHOWK INTERSECTION

Figure 4.1 below shows the IFFCO Chowk intersection. It is a four legged skewed intersection having all the four arms traffic flows more or less equal. In addition to this one more free left arm from Delhi approach is merging at the intersection towards MG Metro station is an additional traffic, which is a continuous traffic flow. Though the traffic signals were installed at this location, these are at the dilapidated condition, hence the traffic operations were carried out Traffic police/Traffic Marshals manually.

Very poor enforcement of traffic rules were observed at all the four arms, road side parking, barbed fencing on the median/channelizers, dilapidated sign boards/non standards sign boards, faded road markings, broken road studs, very poor pedestrian facilities, blocked of newly built subways were observed. The detailed observations and recommendations for the each arm are as discussed below:

Figure 4.1: IFFCO Chowk Intersection (a)

Figure 4.2: IFFCO Chowk Intersection (b)
4.1.1 MG Road Metro Station Approach:

Figure 4.3 to 4.17 shows the audit findings and recommendations. From the Figure 4.1 MG road approach had opening just before the intersection, due to this some of the road users are taking U-turn abruptly turning into opposite direction and no reassurance information signs and road markings and road studs were observed. The findings of Road Safety Audit and recommendations were as discussed below:

Observations:

i) U-Turn traffic taking abrupt turning into wrong side directions from the median openings
ii) No road studs were observed
iii) Informatory signs are misleading
iv) Speed limit signs and no stopping and no Parking signs were not observed
v) Encroachments on stalls on the footpaths
vi) Buses are stopping near to the approach of the intersection
vii) No Road Markings were observed
viii) Median Markings were faded, not visible clearly even day time

Recommendations:

Immediate Measures:

i) Place all the information sign boards at least 250 metres before the intersection as per IRC:67 (2012), Minimum two signs for each approach side.
ii) Place Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iii) Place Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iv) Place Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
v) Enough space for the pedestrian refuge space shall be created
vi) Close the median opening and give U turn provision at the intersection
vii) Strict enforcement is need for the enforcing the wrong side direction vehicles and remove the encroachments.
viii) Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required.
ix) Strict enforcement is needed for buses to stop at the designated places.
x) Remove the redundant and non standard signs near to the approach of the intersection.
xi) Place the No honking signs at least two number in each direction.
xii) Remove the private signs from the intersection area.
xiii) Place the Object Hazard Marker (OHM) at the nose of Median as per IRC:67 (2012).

Long Term Measures:

i) Close the median openings near to the intersection
ii) Open the newly Built Subways for crossing of the pedestrians
iii) Redesign of Intersection area is required
Figure 4.3: Encroachments by road side vendors will obstruct the movement of pedestrians forced to walk on the road, thereby expose to moving traffic, hence strict enforcement is needed (a)

Figure 4.4: Encroachments by road side vendors will obstruct the movement of pedestrians forced to walk on the road, thereby expose to moving traffic, hence strict enforcement is needed (b)
Figure 4.5: Encroachments by road side vendors will obstruct the movement of pedestrians, resulting pedestrians forced to walk on the road, thereby expose to moving traffic, hence strict enforcement is needed (c)

Figure 4.6: Vehicles stopping near to the approach road will create the hindrance to the moving traffic there by congestion created leading to accidents, hence no stopping and no standing signs as per IRC:67 (2012) (Minimum two signs for each approach side is required) (a)
Figure 4.7: Vehicles stopping near to the approach road will create the hindrance to the moving traffic there by congestion created leading to accidents, hence no stopping and no standing signs as per IRC:67 (2012) (Minimum two signs for each approach side is required) (a) & Enforcement is needed

Figure 4.8: Minimum space for the pedestrian to stand while crossing the road is needed, otherwise pedestrian will come across the moving traffic leading to the accidents (a)
Figure 4.9: Minimum space for the pedestrian to stand while crossing the road is needed, otherwise pedestrian will come across the moving traffic leading to the accidents (b)

Figure 4.10: Very poor barricading while the construction is under progress needs as per the IRC: SP-55 (2014) (a)
Figure 4.11: Very poor barricading while the construction is under progress needs as per the IRC: SP-55 (2014) (b)

Figure 4.12: Very poor barricading while the construction is under progress needs as per the IRC: SP-55 (2014) (c) and No directional signs were placed
Figure 4.13: Remove the redundant signs and place the road signs as per the IRC IRC:67 (2012)

Figure 4.14: Road signs are overlapped and not visible to the road users, place the road signs as per the IRC:67 (2012) & trim the branches of trees regularly
Figure 4.15: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a)

Figure 4.16: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (b)
4.1.2 Jaipur to Delhi Approach:

Figure 4.18 to 4.29 shows the audit findings and recommendations. From the Figure 4.1 Jaipur to Delhi road had more than three lane width with no proper road markings and road signs. The findings of Road Safety Audit and recommendations were as discussed below:

Observations:

i) No road studs were observed
ii) Informatory signs in the form of reassurance signs are not found
iii) Speed limit signs and no stopping and no Parking signs were not observed
iv) Encroachments on stalls on the footpaths
v) Buses are stopping near to the approach of the intersection
vi) No Road Markings were observed
vii) Median Markings were faded, not visible clearly even day time
Recommendations:

Immediate Measures:

i) Install all the information sign boards at least 250 metres before the intersection as per IRC:67 (2012), Minimum two signs for each approach side.

ii) Install Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).

iii) Place Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).

iv) Install Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).

v) Strict enforcement is need for the enforcing the wrong side direction vehicles and remove the encroachments.

vi) Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required

vii) Strict enforcement is needed for buses to stop at the designated places

viii) Remove the redundant and non standard signs near to the approach of the intersection

ix) Install the No honking signs at least two number in each direction

x) Remove the private signs from the intersection area.

Figure 4.18: Vehicles stopping near to the approach road will create the hindrance to the moving traffic there by congestion created leading to accidents, hence no stopping and no standing signs as per IRC:67 (2012) (Minimum two signs for each approach side is required) (a) & Enforcement is needed
Figure 4.19: Vehicles stopping near to the approach road will create the hindrance to the moving traffic there by congestion created leading to accidents, hence no stopping and no standing signs as per IRC:67 (2012) (Minimum two signs for each approach side is required) (b) & Enforcement is needed

Figure 4.20: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a)
Figure 4.21: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (b)

Figure 4.22: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015)
Figure 4.23: Vehicles stopping near to the approach road will create the hindrance to the moving traffic there by congestion created leading to accidents, hence no stopping and no standing signs as per IRC:67 (2012) (Minimum two signs for each approach side is required) (a) & Enforcement is needed

Figure 4.24: Vehicles stopping near to the approach road will create the hindrance to the moving traffic there by congestion created leading to accidents, hence no stopping and no standing signs as per IRC:67 (2012) (Minimum two signs for each approach side is required) (b) & Enforcement is needed
Figure 4.25: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) and Stickers on Median dividers should be removed to enhance the safety during night time (a)

Figure 4.26: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) and Stickers on Median dividers should be removed to enhance the safety during night time (b)
Figure 4.27: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) and Enforcement is needed.

Figure 4.28: Transverse Bar Markings (TBM) as per IRC:SP:35 (2015) is needed to reduce the speed near to the intersection area.
4.1.3 Old Gurugram Approach:

Figure 4.30 to 4.36 shows the audit findings and recommendations for the Old Gurugram Approach. From the Figure 4.1 Old Gurugram road with footpaths are encroached by the road side vendors. The findings of Road Safety Audit and recommendations were as discussed below:

**Observations:**

i) No road studs were observed  
ii) Informatory signs in the form of reassurance signs are not found  
iii) Speed limit signs and no stopping and no Parking signs were not observed  
iv) Encroachments on stalls on the footpaths  
v) Buses are stopping near to the approach of the intersection  
vi) No Road Markings were observed  
ii) Median Markings were faded, not visible clearly even day time

**Recommendations:**

*Immediate Measures:*

i) Place all the information sign boards at least 250 metres before the intersection as per IRC:67 (2012), Minimum two signs for each approach side.  
ii) Place Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iii) Place Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iv) Place Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
v) Strict enforcement is need for the enforcing the wrong side direction vehicles and remove the encroachments.
vi) Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required.
vii) Strict enforcement is needed for buses to stop at the designated places.
viii) Remove the redundant and non standard signs near to the approach of the intersection.
ix) Place the No honking signs at least two number in each direction.
x) Remove the private signs from the intersection area.

**Figure 4.30:** No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a) & Median Nose shall be provided with OHM (a).

**Figure 4.31:** No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a) & Median Nose shall be provided with OHM (b).
Figure 4.32: Enforcement is needed to avoid the passengers pick up at the right of the intersection area

Figure 4.33: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a) & Encroachment on Foot paths shall be removed (a).
Figure 4.34: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a) & Encroachment on Foot paths shall be removed (b).

Figure 4.35: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a) & Encroachment on Foot paths shall be removed (c).
Figure 4.36: Encroachment on Foot paths shall be removed

4.1.4 Intersection area improvements:

Figure 4.37 to 4.41 shows the observations at the intersection area. Following are the observations and recommendations for the improvements at the intersection area.

Observations:

i) No road studs were observed in the intersection area
ii) OHM markings are not found at the nose of intersection
iii) Barbed fencing on channelizers will increase the severity of the accidents
iv) No Road Markings were observed

Recommendations:

Immediate Measures:

i) Place Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
ii) Place Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iii) Place Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iv) Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required
v) Strict enforcement is needed for buses to stop at the designated places
vi) Remove the redundant and non standard signs near to the approach of the intersection
vii) Place the No honking signs at least two number in each direction
viii) Remove the private signs from the intersection area.
ix) OHM markings shall be placed at all the nose divider at the intersection area
Figure 4.37: Barbed fencing will increase the severity of accident, hence remove the barbed fencing immediately (a)

Figure 4.38: Barbed fencing will increase the severity of accident, hence remove the barbed fencing immediately (b)
Figure 4.39: Barbed fencing will increase the severity of accident, hence remove the barbed fencing immediately (c)

Figure 4.40: No Road markings were observed at the intersection area, road markings are needed to increase the safety of road users (a)
Figure 4.41: No Road markings were observed at the intersection area, road markings are needed to increase the safety of road users (b)

4.2 ROAD SAFETY AUDIT AND REMEDIAL MEASURES AT DLF CYBER CITY CHOWK INTERSECTION:

Figure 4.42 below shows the DLF Cyber City Chowk intersection. It is a three legged intersection having all the four arms traffic flows more or less equal. This is first intersection where Delhi approach traffic will merge at this intersection. Though the traffic signals were installed at this location, these are at the dilapidated condition, hence the traffic operations most of the times were carried out Traffic police/Traffic Marshals manually.

Very poor enforcement of traffic rules were observed at all the three arms, road side parking, barbed fencing on the median/channelizers, dilapidated sign boards/non standards sign boards, faded road markings, broken road studs, very poor pedestrian facilities, blocked of newly built subways were observed. The detailed observations and recommendations for each arm are as discussed below:
4.2.1 DLF Cyber City Approach:

Figure 4.44 to 4.50 shows the audit findings and recommendations. From the Figure 4.1 DLF Cyber City approach had opening just before the intersection, due to this some of the road users are taking U-turn abruptly turning into opposite direction and no reassurance information signs and road markings and road studs were observed. The findings of Road Safety Audit and recommendations were as discussed below:

**Observations:**

i) U-Turn traffic taking abrupt turning into wrong side directions from the median openings  
ii) No road studs were observed  
iii) No Informatory reassurance signs were observed  
iv) Speed limit signs and no stopping and no Parking signs were not observed  
v) No Road Markings were observed  
vi) Median Markings were faded, not visible clearly even day time  
vii) No Road Studs were observed
Recommendations:

**Immediate Measures:**

i) Install all the information sign boards at least 250 metres before the intersection as per IRC:67 (2012). Minimum two signs for each approach side.

ii) Install Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).

iii) Install Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).

iv) Install Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).

v) Pedestrian circulation plan shall be implemented

vi) Close the median opening and give U turn provision at the intersection area

vii) Strict enforcement is need for the enforcing the wrong side direction vehicles and remove the encroachments.

viii) Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required.

ix) Strict enforcement is needed for buses to stop at the designated places.

x) Remove the redundant and non standard signs near to the approach of the intersection.

xi) Place the No honking signs at least two number in each direction.

xii) Remove the private signs from the intersection area.

xiii) Place the Object Hazard Marker (OHM) at all the pillars and at the nose of Median as per IRC:67 (2012).

**Long Term Measures:**

i) built Subway or Foot Over bridge for crossing of the pedestrians

ii) Redesign of Intersection area is required

Figure 4.44: No Road Markings were observed, road markings are needed as per the IRC:SP:35 (2015) (a)
Figure 4.45: No Road Markings and Edge/Kerb markings were observed, road markings are needed as per the IRC:SP:35 (2015)

Figure 4.46: All the Pillar shall be pasted/painted with Object Hazard markers to enhance the visibility for the road users (a)
**Figure 4.47:** All the Pillar shall be pasted/painted with Object Hazard markers to enhance the visibility for the road users (b)

**Figure 4.48:** All the Pillar shall be pasted/painted with Object Hazard markers to enhance the visibility for the road users (c)
Figure 4.49: All the Pillar shall be pasted/painted with Object Hazard markers to enhance the visibility for the road users (d)

Figure 4.50: All the Pillar shall be pasted/painted with Object Hazard markers to enhance the visibility for the road users and Close the median opening which is creating conflicts among the same direction traffic
4.2.2 Jaipur - Delhi Approach:

Figure 4.50 to 4.55 shows the audit findings and recommendations. From the Figure 4.1 DLF Cyber City approach had opening just before the intersection, due to this some of the road users are taking U-turn abruptly turning into opposite direction and no reassurance information signs and road markings and road studs were observed. The findings of Road Safety Audit and recommendations were as discussed below:

Observations:

i) U-Turn traffic taking abrupt turning into wrong side directions from the median openings
ii) No road studs were observed
iii) No Informatory reassurance signs were observed
iv) Speed limit signs and no stopping and no Parking signs were not observed
v) No Road Markings were observed
vi) Median Markings were faded, not visible clearly even day time
vii) No Road Studs were observed

Recommendations:

Immediate Measures:

i) Install all the information sign boards at least 250 metres before the intersection as per IRC:67 (2012), Minimum two signs for each approach side.
ii) Install Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iii) Install Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iv) Install Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
v) Pedestrian circulation plan shall be implemented
vi) Close the median opening and give U turn provision at the intersection area
vii) Strict enforcement is need for the enforcing the wrong side direction vehicles and remove the encroachments.
viii) Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required.
ix) Strict enforcement is needed for buses to stop at the designated places.
x) Remove the redundant and non standard signs near to the approach of the intersection.
xi) Place the No honking signs at least two number in each direction.
xii) Remove the private signs from the intersection area.
xiii) Place the Object Hazard Marker (OHM) at all the pillars and at the nose of Median as per IRC:67 (2012).
Figure 4.51: No Road Markings and road studs were observed, road markings are needed as per the IRC:SP:35 (2015) (a)

Figure 4.52: No Road Markings and road studs were observed, road markings are needed as per the IRC:SP:35 (2015) (b)
Figure 4.53: No Road Markings and road studs were observed, road markings are needed as per the IRC:SP:35 (2015) (c)

Figure 4.54: No stopping and no parking signs were needed and Enforcement is essential (a)
4.2.3 Intersection area improvements:

From the field observations at the intersection area. Following are the observations and recommendations for the improvements at the intersection area.

Observations:

i) No road studs were observed in the intersection area
ii) OHM markings are not found at the nose of intersection
iii) No Road Markings were observed

Recommendations:

Immediate Measures:

i) Place Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
ii) Place Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iii) Place Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
iv) Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required
v) Strict enforcement is needed for buses to stop at the designated places
vi) Remove the redundant and non standard signs near to the approach of the intersection
vii) Place the No honking signs at least two number in each direction
viii) Remove the private signs from the intersection area.
ix) OHM markings shall be placed at all the nose divider at the intersection area
x) Install the Transverse Bar Markings on all the approaches before 150 metres from the intersections as given in the action plan
5 ACTION PLAN

As per the request made by the M/s. AB In Bev (India) to CSIR-CRRI, New Delhi, CSIR-CRRI has taken up the task of conducting Road Safety Audit of the top Ten Black spot locations on Gurugram City Road Network. Accordingly in this report two locations (IFFCO Chowk Intersection & Cyber City Chowk Intersection) Road Safety Audit findings along with the safety measures in immediate and long term solutions were suggested. To enhance safety, the following action plans are recommended.

5.1 Road Surface

The road surface also plays very important role in road safety and it is always recommended to have a good road surface to enhance the safety situation on the road. The road surface of the entire at IFFCO Chowk intersection some part of the intersection is area is under construction proper barricading is required. Cyber City Chowk intersection area is in good condition, however regular maintenance is needed for proper upkeep of the pavement surface.

5.2 Intersections Improvements

The IFFCO Chowk and Cyber City Chowk as part of along term measures, these two locations require geometric improvements. The improvement shall be carried out conforming to IRC: SP-73 (2015). Depending on the available Row, all the geometric design improvement shall be carried out conforming to IRC: SP-41 (1994).

5.3 Visual Aids to Improve the Safety of Road User

It is recommended to install new visual aids in the form of various types of road appropriate signs (suiting to the needs), flashing signals, retro-reflective markers, delineators, chevron markings, chevron signs at curves and road markings such as lane marking, pavement marking, object marking, zebra crossings etc. as typically presented in the audit report (Figure 5.1). These would provide positive guidance to the road users and thus help to enhance safety for all types of road users both during day and night. Further at all the sharp vertical and horizontal curves as well as on the Minor Roads intersecting with the Project Corridor, consider providing Solar Powered Blinkers on the Project Corridor as shown in Figure 5.2 which would help to exercise caution while driving and sensitize all types of road users. Moreover, at such locations, also consider providing appropriate signs (as given in Section 6) along with road studs [spaced at 9 m centre to centre conforming to IRC: 35 (2015)] coupled with Transverse Bar Marking (TBM) as shown in Figure 5.3. Further in the case of sharp horizontal curves, Concave Lens shall be provided on the farther side as shown in Figure 5.4 which would enable to visualize the traffic emerging from the opposite direction of travel.
Figure 5.1: Typical Example of Proposed Safety Features at Horizontal Curves on a Two lane Undivided Carriageway

* Not to Scale
Figure 5.2: Typical Example of Solar Powered Blinkers to caution the road users to reduce speed

Figure 5.3: Typical Example of Transverse Bar Markings - To be deployed ‘before’ and ‘after’ the valley curve, sharp horizontal curves and approach to the hazardous locations.
As mentioned in the audit report, there are several vulnerable spots on the corridor that requires special treatment on the part of OWD. It is essential to sensitize the Vulnerable Road Users as well as vehicle users about the existence of such hazardous locations on the Project Corridor and efficiently guide them through such locations by providing special treatments. These are known as the 'Hazardous Reach Treatment'. At places where Traffic Calming is required such as sharp horizontal curves and crash prone locations, Thermoplastic Bar Markings (TBM) need to be provided (Figure 5.5) conforming to IRC:35:2015. However, the thickness of the TBM may be kept at 8 mm for achieving effective speed reduction.
Figure 5.5: Typical Example of Hazardous Reach Treatment with Traffic Calming using Thermoplastic Bar Markings.
At places, especially near Market areas, Schools, Colleges and Hospitals which witnesses marked pedestrian activity, there is a need to forewarn the users and also to implement appropriate traffic calming measures in the form of Speed Breakers conforming to IRC:35 (2015). Moreover, such locations shall be accorded the following 'Vulnerable Reach Treatment' as envisaged in Figure 5.6.

Figure 5.6: Typical Example of Venerable Reach Treatment with Traffic Calming near Built-up Areas.
At locations where stand-alone designated Pedestrian Crossings have been provided, it is recommended to provide the treatment as shown in Figure 5.7. Although Figure 5.7 does not depict the use of Traffic Calming Measures, it is strongly recommended to provide either the soft treatments in the form of Thermoplastic Bar Markings or hard treatment in the form of Speed Breaker at all such locations.

Figure 5.7: Typical Example of provisions for stand-alone Pedestrian Crossings.
5.5 Appropriate Design of Road Humps

In the audit report, it has been recommended to provide Road (Speed) Humps at all the minor/side roads that directly join the project road. It is also strongly recommended to use the road hump design as specified in IRC: 35 (2015) and shown in Figure 5.8 for effective speed reduction as well as to prevent the ‘speed humps’ themselves turning out to be serious hazards.

*Figure 5.8: Typical Design Details of Road Humps to be provided on Minor/Side Roads.*
5.6 End Treatment for Metal Beam Crash Barriers

On the project road, there are certain locations where Crash Barriers are required. The absence of crash barrier can prove hazardous for the errant vehicles resulting in loss of life of any involved individual(s) in such road crashes. Therefore, it is recommended to provide Modified Eccentric Loader Terminal (MELT) treatment at the approach end of the Crash Barriers (Figure 5.9) and Trailing Terminal (TT) treatment at the departure end (Figure 5.10) as specified in IRC:SP:119 (2015).

Figure 5.9: Modified Eccentric Loader Terminal (MELT) Arrangement for Approach Side of the Metal Beam Crash Barrier.
5.7 Control of Encroachments in Urban Areas

Some part of the Project Corridor is passing through well developed urban areas wherein road is encroached by the hawkers in the form of street vendors / shops / weekly market areas / repair vehicles / stacking of all types of construction materials including private housing items. These activities spread across the road creating potential crash prone locations. To control the above such types of encroachments, it is strongly recommended for strict monitoring by local enforcement agencies and subsequent evacuation of any such encroachments at the early stages with the help of Police. Further, these activities shall be controlled in the long run by using any one of following methods in the form of low height fencing as given in Figure 5.11.
5.8 Other Safety Measures

- At locations, where designated Pedestrian Crossings are provided on the Project Corridor green studs shall be provided on Zebra Crossings. Moreover, the designated pedestrian crossing earmarked along the project road shall be illuminated using Solar Paneled street lighting system/normal electrification, which can help in enhancing safety for the commuting pedestrians.

- All Intersections shall be illuminated by providing minimum street lighting measuring up to 40 Lux.

- Retro reflective Tape should be pasted on the trees / electric poles which are located within the recovery zone / formation width or adjacent to the carriageway on Soft Shoulder portion.

- It is recommended to prune the trees which are obscuring the sign boards.

- It is recommended to remove the construction material adjacent to the road, install facility signs at all the petrol pumps on the corridors, and cover the side drains as mentioned in the report.

- At many locations, construction debris are lying on the roadside should be removed.

- It is recommended to remove the unauthorized parking and encroachments wherein the alignment passes through urbanized areas.

- Place the Emergency Telephone numbers like the Police Helpline, Ambulance Number, nearest Hospital numbers, etc.) at least two locations on each approach

- At the intersection are proper pedestrian circulation moments shall be provided.

- Remove the barbed fencing on the channelizers of intersection area at IFFCO chowk.

- Strict enforcement is required by the Police agency to discourage the on on street parking near to the intersection area, as well as stopping of buses and taxis and Autos near to the intersection area.

- Remove the redundant road signs and private signs
- Install all the information sign boards (reassurance Signs) at least 250 metres before the intersection as per IRC:67 (2012), Minimum two signs for each approach side.
- Install Road Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
- Install Median Markings on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
- Install Road Studs on both directions (LHS & RHS) as per the IRC: SP:35 (2015).
- Pedestrian circulation plan shall be implemented.
- Close the median opening and give U turn provision at the intersection area.
- Strict enforcement is need for the enforcing the wrong side direction vehicles and remove the encroachments.
- Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012), at least minimum Two in each side is required.
- Strict enforcement is needed for buses to stop at the designated places.
- Speed limit signs and no stopping and no Parking signs shall be placed as per IRC:67 (2012).
- Remove the redundant and non standard signs near to the approach of the intersection.
- Place the No honking signs at least two number in each direction.
- Remove the private signs from the intersection area.
- Place the Object Hazard Marker (OHM) at all the pillars and at the nose of Median as per IRC:67 (2012).
- Install the Speed tables with the proper road markings and signs at the free left turning movements at the intersections to reduce the free left turning vehicles speeds.