REPORT ON SAFETY AUDIT OF PUNE SATARA ROAD BETWEEN SWARGATE AND KATRAJ JUNCTIONS

Submitted to:

ADDITIONAL CITY ENGINEER (BP & DP)
PUNE MUNICIPAL CORPORATION

By

Creations Engineers Pvt. Ltd. and Pavetech Consulting Engineering Services Pvt. Ltd.

TABLE OF CONTENTS

Contents

REPORT ON SAFETY AUDIT OF PUNE SATARA ROAD BETWEEN SWARGATE AND KATRAJ JUNCTIONS

Introduction:

The Pune Satara Road under Pune Municipal Corporation limit is a major arterial road in the city. This road connects the city centre to the NH4 (Katraj Dehu Road bypass), Pune Bangalore highway. This route has been developed as a BRTS route by PMC and also proposed as a metro corridor under the PMC comprehensive mobility plan.

The Swargate junction on this road is the busiest and most heavily trafficked junction in the city as it houses the largest state transport bus depot in the city. The other important junctions on this road include the Laxmi Narayan Theatre junction, Market Yard junction, Bibwewadi Junction, Padmavati Junction, Dhankawadi Junction, BaratiVidyapeth Junction, Katraj Zoo Junction and the NH 4 junction. Even though the BRTS work of segregated bus lanes has been completed in 2009-10, there are ongoing works of new flyovers at the Swargate Junction (undertaken through MSRDC) and Dhankawadi junction (through PMC). A subway is also under construction at the Bibwewadi junction. Thus the ongoing construction activities and the heavy traffic intensity, error on part of drivers combined with present discontinuity in the existing BRTS network have led to a series of accidents on the road during the past few months. PMC decided to undertake a Road Safety Audit study of this road corridor in order to record present situation, time bound solutions to minimize the risk of accidents, avoid creating future accidents and suggest improvement in the existing infrastructure as well as the proposed projects so as to provide a safe access to all the road users at all times.

The guidelines of IRC Special Publication number 88-2010 “Manual on Road Safety Audit” have been used for conducting the road safety audit study. The IIT Safety Audit Report on BRTS roads was also used as a guiding tool for preparation of this report. Accordingly, the stage wise audit was performed by the audit team by studying the available drawings, records from PMC, project consultants and field

visits thereof during the daytime and night time. Based on the above, the safety audit report is prepared comprising the field observation and findings of the team and phase wise recommendations for overall improvement in the safety of all road users on this project corridor. In the similar situation appropriate recommendations in this report may also be enforced by PMC on other major corridors in the city.

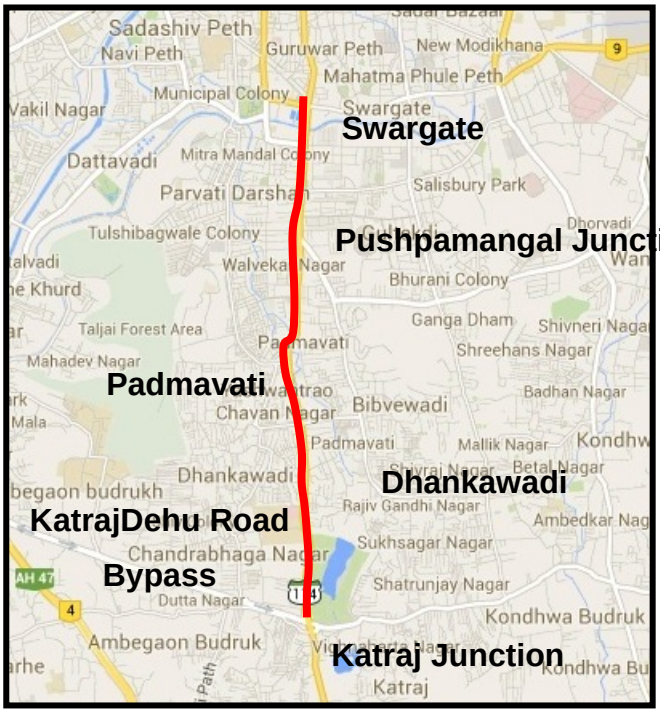
Brief details of the project corridor

The total length of the project corridor between Swargate and Katraj junctions is 6.10 km. This is a 45 m DP road of PMC. The cross sectional configuration is 1+1 lanes for segregated BRTS, 2+2 lanes for mixed traffic, a footpath, service road, cycle track and footpaths. The BRTS corridor at the centre is separated by medians from MV lanes. The original plan had designated punctures in the segregated BRTS corridor at major intersections. Due to major ongoing construction works, out of project length, sections between Katraj Junction to Bharati Vidyapeeth (length 1.00 km), section between Swami Vivekanand statue junction to Pushpamangal junction (length 1.10 m), and section in front of Swargate ST Bus depot (0.170 m) is functional as a segregated BRTS corridor as originally planned with BRTS separators and central bus stops. In the remaining stretch of about 3.83 kms due to ongoing construction works, the buses ply in MV lanes instead of segregated BRTS corridor. The following projects are ongoing in the remaining length of 2.1 kms of this road corridor.

1. Construction of flyover and grade separator at Swargate and Laxminarayan junction
2. Construction of pedestrian subway near Saibaba temple
3. Construction of vehicular cum pedestrian subway at Bibwewadi junction (Pushpamangal junction)
4. Construction of flyover between Shankar Maharaj Math and BharatiVidyapeeeth (Dhankawadi).

Hence, out of total 6.00 km length of the BRTS project, only 2.27 km length is functional as a segregated BRTS corridor with central bus stops and that too with many fractures. For the balance length of the corridor, the segregated BRTS has

been discontinued and mixed bus lanes are operational with bus stops at the edge of the carriageway.



Map of the project corridor between Swargate and Katraj junctions

Review of the project documents

The drawings of the completed and ongoing projects were made available to the audit team by PMC. The following drawings were available.

1. BRTS section between Swargate and Katraj junctions- As built drawings (only plan)
2. Construction of flyover and grade separator at Swargate and Laxminarayan junction – GAD of the project with plan and L sections.
3. Construction of pedestrian subway near Saibaba temple – GAD of the project.
4. Construction of vehicular cum pedestrian subway at Pushpamangal junction – GAD of project with plan and L Sections.
5. Construction of flyover between Shankar Maharaj Math and Bharati Vidyapeeeth (Dhankawadi). – GAD of project with plan and L Sections.

Observations about the existing ongoing construction projects.

The observations of the audit team on the existing ongoing projects are summarized below.

A. Bridge and Grade Separator at Swargate junction.

The Swargate junction traffic solution consists of the following components:

1. Two lane flyover 7.5 m wide crossing Laxminarayan Intersection in the direction from Swargate to Satara.
2. Two lane Flyover 7.5 m wide from Satara side over Laxminarayan intersection diverging into two arms at Swargate intersection - one landing on Saras Baug side of 7.5 m wide and one landing on Shankar Sheth Road of 7.5 m wide.
3. 8.1 m wide Grade Separator from Shankar Sheth Road side to Saras Baug side.

The flyover is designed with PSC hollow box girders. The plan, sectional arrangements and vertical clearances are as per IRC Standards in force. Adequate provisions for pedestrian footpaths have been maintained wherever adequate ROW

is available. The ROW of Satara road is 45 m whereas the ROW of Shankar Sheth Road is 36 m.

The section M-M near Swargate S.T. Terminus on the exit side on Shankar Sheth Road is not available for review.

B. Pedestrian Underpass opposite Sai Mandir on Satara Road.

The underpass is exclusively a pedestrian facility with a convenient shopping facility. The underpass spans the width of Satara Road and is 6.5 m in width. There is a provision for convenient shopping each measuring 2 m in width and 3 m in length. The structure is designed as a RCC Box structure. The length of the underpass is 30 m and vertical clearance is 2.55 m. The underpass has been raised to facilitate easy pedestrian accessibility with less number of steps at entry and exit. The proposed flyover under construction at Laxminarayan intersection has both the down and up ramps originating on the underpass.

C. Two Wheeler & Pedestrian underpass in Pushpamangal Intersection.

The underpass is U shaped and measures 5.0 m for two wheelers access along the width of Satara road and 3.5 m on the exit towards Swargate. The structure is designed as a RCC Box structure.The carriageway for pedestrian access is 1.5 m throughout the length of the underpass. One arm exiting on Pushpamangal Karyalaya side is 5 m wide throughout and restricted only for pedestrian movement. The two wheeler flow is designed uni-directional from Bibwewadi side to Swargate side. Pedestrian entry and exit ramps have been proposed at all locations as per GAD. A vertical clearance of 2.7 m inside the underpass has been maintained. The underpass has been raised to facilitate easy pedestrian accessibility with less number of steps at entry and exit.The land at entry ramp on Bibwewadi side is yet to be acquired.

D. Flyover at Dhankawadi junction

The flyover under construction at Dhankawadi is a Reinforced concrete deck supported on multi-span prestressed girders. This flyover is having 2+2 lanes to and

fro from Swargate side towards Satara side. The length of the flyover is 980 m excluding approaches. At Swargate side two separated approach ramps (by central at grade BRTS corridor) converge into a single deck and at Satara side diverge again into two down ramps separated by central at grade BRTS corridor. This design has been suited to the operation of BRTS. The plan, sectional arrangements and vertical clearances are as per IRC Standards in force. The flyover has been aligned in the centre of the existing carriageway. Adequate provisions for pedestrian footpaths and cycle tracks have been maintained wherever adequate ROW is available.

Field study of the existing project corridor

The visit to the project corridor was conducted by the project team during daytime dated 30/03/2014 and during night time dated 03/04/2014. An independent observation was also made to assess the travel time and speed between the Swargate and Katraj junctions during peak hour period. It was observed that the average speed of vehicles on the project corridor is between 20 km/h to 24 km/h.

The observations of the audit team along with the chainagewise photographs are summarized below.

FROM SWARGATE (Chainage 6/100 m) TO KATRAJ (Chainage 0/000 m)




Swargate Junction outside ST depot (Chainage 5/975 RHS side Coordinates 18.500303, 73.858554) -The present condition of footpath with broken tiles, damaged railing, damaged kerbs, dislodged chamber covers, cables, debris and dirt dumped on the footpath makes it completely inaccessible to pedestrians who are forced to walk on the carriageway in the traffic flow thus occupying space for vehicles and endangering their own safety. Improvement in the above marked conditions of footpath and user utilities is necessitated on an urgent basis. This location is the convergence point for all modes of transport exiting Pune on the South, West and East side and therefore optimum use of available carriageway widths is necessary.

Swargate Junction outside ST depot (Chainage 6/000 RHS side coordinates 18.500568, 73.858476):Mixed traffic conditions with trucks, buses, two wheelers, NMT and public disregard to follow traffic rules creates difficult crossing situation for pedestrians. The pedestrian count being very high at this junction, improved and safe pedestrian movement facilities have to be encouraged. Segregation of heavy and other vehicles may also be implemented if the carriageway widths permit and will have to be resolved with a holistic approach.

Swargate Junction outside ST depot (Chainage 5/950 RHS side Coordinates 18.500568, 73.858476): Pedestrians using the main carriageway have to walk near Swargate junction as the footpath space is inaccessible and hence not in use. Concurrently, space occupied by pedestrians creates traffic congestion at the junction and also endangers pedestrian safety.

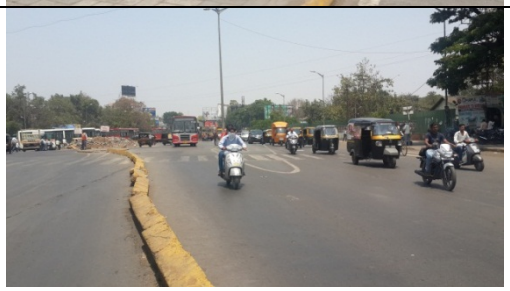
Swargate Junction outside ST depot (Chainage 6/000 RHS side Coordinates 18.500568, 73.858476): Space occupied by street hawkers during the day and night time creates difficult walking conditions for pedestrians and thereby restricting the width of vehicular space of the main carriageway.

Outside Swargate ST Bus Depot (Chainage 5/900 RHS side Coordinates 18.500090, 73.858390) Inadequately marked pedestrian crossings at the BRTS bus stop near Swargate junction forces the BRTS users to take the shortest available route to cross the road through oncoming traffic thus endangering their safety. It is also observed that the buses try to use the bus stop space on each side of bus stop on either side. There is an urgent necessity to construct raised pedestrian / demarcated crossings all along the BRTS corridor.




In front of new PMT Bus depot at Swargate (Ch 5/800 Coordinates 18.500090, 73.858390): The widened carriageway in front of Swargate ST depot is uncontrolled due to the absence of traffic island, chanellizers etc. S.T. buses exiting the S.T. terminus conflict with the mixed traffic coming from Shankar Sheth Road, Tilak Road and Shivaji Road thereby leading to a queuing at the Swargate junction. Also, hawkers and auto rickshaws parked abutting the terminus compound wall make it difficult for the exiting buses to manoeuvre and therefore a complete ban on hawkers and channelization of auto rickshaws is imperative.



Chainage 5/750 Coordinates 18.498411, 73.858194: Construction debris due to removal of traffic island and haphazardly arranged concrete blocks for BRTS delineation creates hazardous driving conditions. Replacement of these loose blocks with new jersey type concrete barriers (removable type RCC barriers) until completion of the flyover work is necessary.

Chainage 5/700 LHS side Coordinates: 18.498411, 73.858194 - The present condition of the footpath, cycle track locations along the new Swargate flyover construction needs marked improvement. It is necessary to rebuild the carriageway by merging with the cycle track until the completion of the flyover. This work also needs the rebuilding of raised and clearly separated footpath with safety railing. The footpath space is occupied by vendors and these need to be shifted/removed.

Chainage 5/650 RHS side Coord18.498411, 73.858194: Concrete ramp at joint between the main carriageway and cycle track in between Swargate and Laxminarayan junction is in poor condition; makes driving difficult: also gives unnecessary access to the vehicles to the cycle track and pedestrian area

Laxminarayan junction on Mukund Nagar side (Chainage 5/550 RHS side Coordinates 18.498411, 73.858194)– Improvement in pedestrian accesses at this junction is urgently required. Pedestrian movement is restricted due to construction and other debris, vendors, hawkers and also blocked by street light poles, signal poles, traffic signage poles and electrical / phone boxes. This situation is more or less common to all the major junctions.

Laxminarayan junction on Mitra Mandal side (Chainage 5/550 LHS side) - Tin sheet barricading needs to be replaced with safe well fabricated MS barricading. Some tin sheets are opened and loose which pose danger to vehicles. The pedestrian accesses are blocked by hutments on the footpath. The cross cuts and digging due to service utilities need to be urgently tackled.

Footpath and cycle track after the Laxminarayan junction (Chainage 5/525 RHS side Coordinates 18.498411, 73.858194) – The cable bobbin of the MSEDCL and excavation debris is dumped on the footpath thus blocking the access to pedestrians.

Service road in front of Saibaba Mandir (Chainage 5/350 RHS side18.498411, 73.858194) is deteriorated and haphazard parking and use for commercial activities like loading and unloading during daytime creates unusable conditions for local traffic.

Location in front of Reliance Digital mart (Coordinates 18.494532, 73.858073) – The break in the BRTS corridor due to ongoing construction has created an unsafe merging location for fast moving buses from central BRTS corridor to merge with the vehciles on the main carrigeway. Other vehicles also cross the BRTS corridor at this location leading to a high accident potential at this location. It is recommended that traffic calming measures shall be provided at the end of dedicated BRT corridor to reduce the speed of merging buses.

Panchami Hotel junction (Chainage 5/100 Coord- 18.498411, 73.858194) – The BRTS is discontinued after this junction and speeding buses from BRTS corridor merge into the main carriageway traffic posing danger to the oncoming vehicles in the main carriageway. There is no advanced warning sign to vehicles on main carriageway about the merging buses. Hence traffic calming measures are recommended.

Cycle track and footpath occupied by parked vehicles between Panchami junction and Utsav Hotel junction (Chainage 4/850 RHS side18.498411, 73.858194) forcing the pedestrians on to the main carriageway. Poor condition of concrete ramps at at various property entrances is observed.

Pushpamangal junction (Chainage 4/500 RHS side18.486996, 73.857535) – Excavation debris is littered at the edge of the ongoing subway and poor traffic barricading with thin tin sheets on the service road endangers vehicle and pedestrian safety. The height of the RCC crash barriers at the edge need to be raised suitably after completion of the bituminous works in the ramp portions. It is also recommended that the vehicles coming from Swargate side and going towards Bibwewadi side (left turn movement) from top of RCC box shall be banned and it is also recommended that this vehicle movement shall be restricted in the lane between footpath and end of RCC box.

Pushpamangal junction (Chainage 4/500Coordi18.486996, 73.857535) – Resurfacing of the junction area has resulted in significant increase in the vehicular speed. Traffic calming measures like chanellization, road marking, signages etc need to be undertaken before the completion of the project. The segregation of traffic from Satara road and Bibwewadi is required to avoid conflict of traffic from Bibwewadi crossing the traffic from Katraj moving towards Swargate. Fattening the junction and ramp slopes is already initiated despite probable problems with the adjacent accesses.

Section between Pushpamangal chowk and Padmavati junction (Chainage 4/300 Coordi18.473105, 73.856618& 3/700 RHS side) – The level difference of 30-40 mm

between the concrete pavement and the BT edge creates unsafe riding condition for two wheelers. The SWD chambers are in poor shape and settled chambers with damaged covers need to be repaired.

Dhankawadi Flyover construction zone (Chainage 3/200 RHS side18.473105, 73.856618) – The construction zone lacks adequate advanced warning signs. The girder casting yard is located in the centre of carriageway and the carriageway has been widened upto end of the ROW. This has resulted in the elimination of footpaths inconveniencing pedestrians. It is recommended to provide segregated pedestrian passage by providing MS barricading.

Chainage 3/150 RHS side -Level difference in existing carriageway and the construction zone is ill protected and needs continuous barricading.

Construction zone Dhankawadi flyover (Chainage 3/050 RHS side18.473105, 73.856618) – Exposed reinforcement of the RCC wall under construction needs to be barricaded.

Near Balaji Nagar Junction (Chainage 2/ 550 m RHS side18.468892, 73.857927) – Protruding frame and RCC chambers of utilities create obstructions in the main carriageway.

Construction zone Dhankawadi flyover (Chainage 2/350 RHS side18.465086, 73.858158)– The edge strip of 3 to 3.5 m (one lane) is in a bad condition and needs to be replaced / repaired by eliminating the level difference which tends to lower the speeds of two wheelers and other vehicles and results in congestion. Parking in this area needs to be banned until the completion of flyover.

Petrol pump near Dhankawadi Bus route (Chainage 1/950 RHS side18.464231, 73.858330) – The location of Bus stop and ongoing construction work has reduced the width of carriageway. The physical state of the carriageway needs urgent improvement.

Chainage 1/900 RHS side18.464231, 73.858330: Poorly maintained service roads along the ongoing construction project create hazardous driving conditions for all road users. The physical state of the carriageway needs urgent improvement.

Chainage 1/750 RHS side18.460663, 73.858184: Poor condition of the edge strip, concrete ramp joint has rendered the space unutilized along the construction zone of Dhankawadi flyover/

Chainage 1/650 RHS side 18.460663, 73.858184: A tree in between the main carriageway and service road obstructs vision and poses danger to oncoming traffic.

Chainage 0/400 m LHS side – Break in the BRTS corridor at minor cross road gives access to all other vehicles to cross the BRTS corridor creating unsafe driving condition for the BRTS buses as well as the other vehicles.

Katraj Zoo junction (Chainage 0/800 m 18.454435, 73.858613)– Cross cut taken by MNGL has left the main carriageway in poor condition and unattended. Driving conditions are extremely hazardous. There is lack of channelization at this wide junction creating chaotic situation. There is no provision for a pedestrian crossing in this stretch where the road is 60 m wide at the junction.

FROM KATRAJ TO SWARGATE

Chainage 1/600 LHS side 18.461844, 73.857798: Inadequate construction barricading for ongoing flyover should be improved. Advance warning signs need to be installed showing obstruction, reduction of carriageway width etc.

Balaji Nagar junction (Chainage 2/300 LHS side 18.468276, 73.857390) – Improvement at corners due to existing electrical poles, boxes, debris, cables, etc is necessary. Improvement is necessary to eliminate the level difference in the paved carriageway and settled SWD chambers on urgent basis.

Chainage 2/325 LHS side 18.468276, 73.857390: All SWD chamber covers at this location need to be repaired/ replaced to match with the level of the resurfaced carriageway




Chainage 2/600 LHS side 18.472073, 73.856421: Service road opposite Shankar Maharaj Math is completely occupied by parked vehicles (two wheelers and cars) by the dealers who own showrooms in this stretch (Deccan Honda, Vijay Motors, Mahindra two wheelers). Debris on the main carriageway should be removed and traffic signage, diversion board, etc need to be installed to warn the users about the obstructions on the road.


Chainage 3/250 LHS side 18.477792, 73.856893: Damaged separator blocks of BRTS corridor at Padmavati junction create unsafe condition for two wheelers and cars and need to be repaired.

Chainage 3/450 LHS side 18.482106, 73.857022: The service road area, footpath and cycle track has been excavated by MNGL and no safety measures, traffic diversion arrangement, signage, etc. have been installed. General sensitivity of service providers towards user safety is found to be in vast disparity with PMC requirements. Pedestrian access is completely blocked and it is necessary that all utility providers should be refrained from commencing any work without installing

adequate safety measures. Alignment of their services is short of any rationale.

Chianage 5/600 LHS side 18.497409, 73.857880: Damaged concrete ramp edge with longitudinal level difference abutting the flyover construction area creating hazard to vehicles. The level difference needs to be rectified.

Location of Rao Hospital Chainage 4/050 RHS side 18.480152, 73.857429- Pedestrian crossings at various locations need to be demarcated by thermoplastic strips or raised pedestrian crossings in order to curb unsafe crossing by pedestrains.

Chainage 2/400 RHS side 18.468409, 73.857880: Poor condition of footpath and deflected SWD chambers at the Balaji Nagar junction need urgent repairs / rehabilitation.

Chainage 2/250 RHS side 18.464379, 73.858245: Safety nets need to be provided on either side along the entire length of the flyover under construction for safety of traffic plying under the ongoing construction work as well as the workers on the

flyover project.




Chainage 2/200 RHS side 18.465987, 73.858159: Footpaths with missing / disjointed pavers need to be rectified as pedestrians avoid such stretches and flow over on to the main carriageway.


Chainage 2/100 RHS side 18.462303, 73.858245: MS flats used in the railing for BRTS corridor with open joints pose a grave threat to commuters, especially two wheelers and accidents can pose a grave risk and be fatal since they are at the head or neck level of the two wheeler riders or pillions.

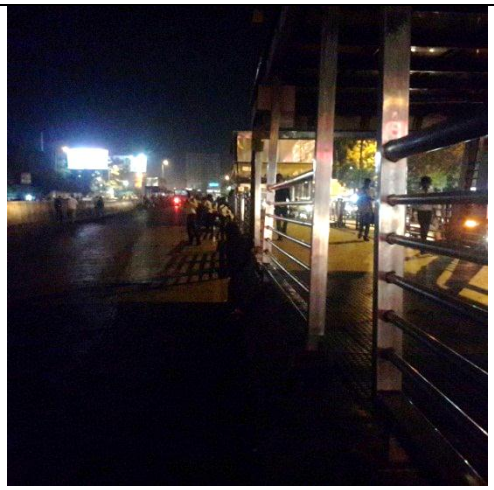
Chianage 1/500 RHS side 18.462140, 73.858245: Discontinuous cycle track and footpath between Dhankawadi Bus route and BharatiVidyapeeth need to be urgently rectified/ restored.

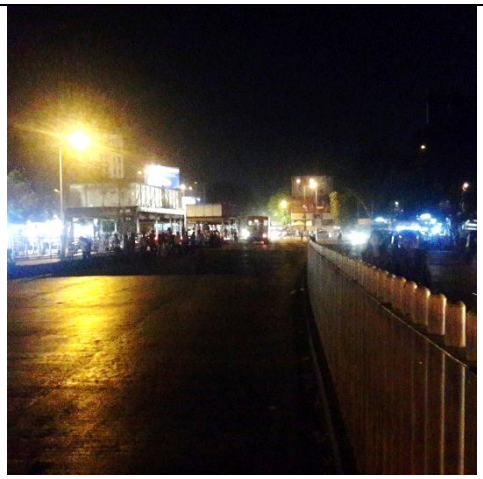

Chainage 1/350 RHS side 18.460145, 73.858138: The entrance to the vehicular subway leading to Bharati Vidyapeeth needs to be demarcated with advanced direction boards and delineated. Concrete block on the main carriageway abutting the subway wall needs to be urgently removed.



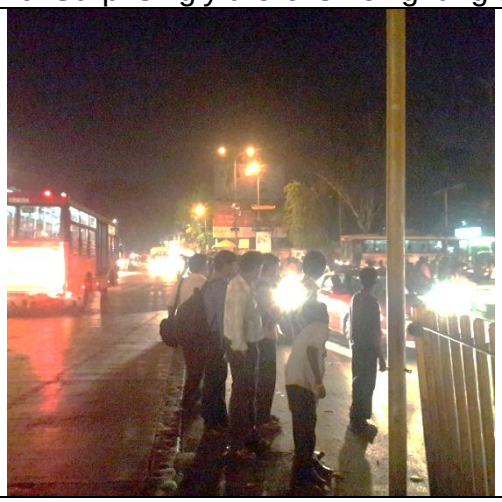

Chainage 0/800 m RHS side 18.454446, 73.858846: The entire stretch of footpath needs to be rectified near Katraj Zoo Junction in order to eliminate the level difference. The main carriageway needs resurfacing and matching of levels.

Chainage 2/450 LHS side 18.469223, 73.857194: Difference of 40 -50 mm in longitudinal direction (gaps) in the main carriageway leads to skidding of the two wheelers and needs to be rectified urgently.

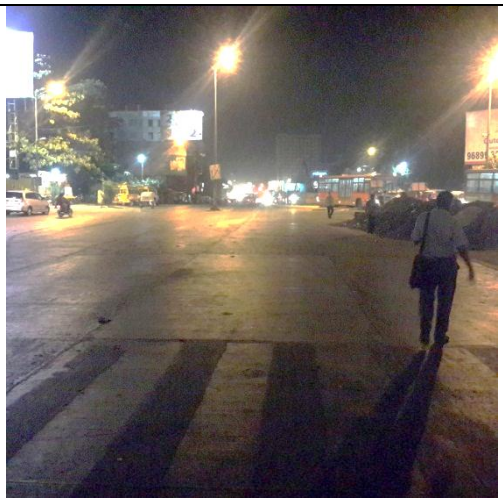





Chainage 5/850 m18.500131, 73.858385: Lack of adequate illumination at Swargate junction BRTS bus stops creating unsafe conditions for pedestrians and vehicular traffic. Surprisingly there is no lighting arrangement at most of the BRTS bus stops.




Chainage 5/825 m 18.500131, 73.858385: Pedestrians cross the road across heavy commercial traffic and buses due to absence of raised pedestrian crossings endangering pedestrian safety. Senior citizens, students are the most affected by lack of pedestrian facilities.

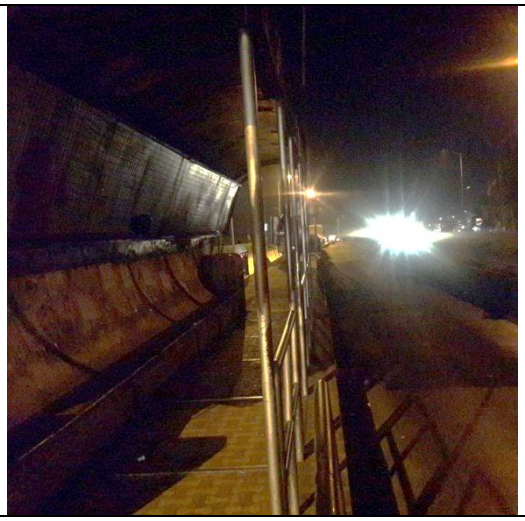


Swargate junction Chainage 5/800 m 18.498676, 73.858310– Removal of chanellization island, wide road width, poor illumination and lack of traffic signal creates a chaotic situation in front of Swargate Bus depot entrance putting two wheelers and pedestrians at high risk of physical injury. The lighting arrangement at the edge of the ROW is inadequate to illuminate the ROW and BRTS corridor. Street light poles are installed at the extreme edge of the ROW. BRTS is partially functional and buses going towards Katraj from the bus stop move at high speed when entering the intersection.

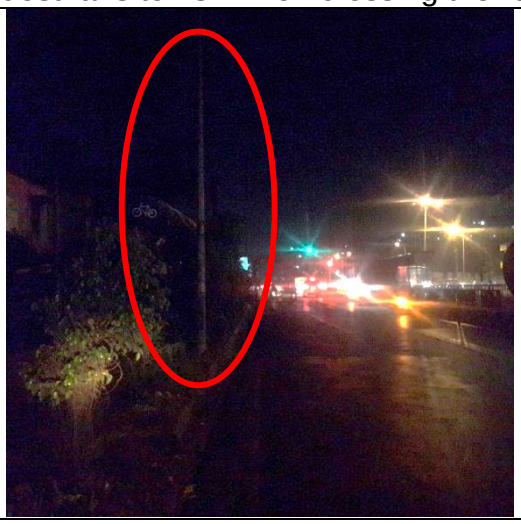
Chainage 5/750 RHS side18.497496, 73.858310: Haphazardly placed concrete blocks and lack of any road markings pose a hazard due to lack of adequate illumination.

Chainage 5/725 RHS side18.497089, 73.858310: Lack of any illumination on footpath outside Swargate State Transport Terminus. There is complete darkness in 60 -70 m portion of footpath.

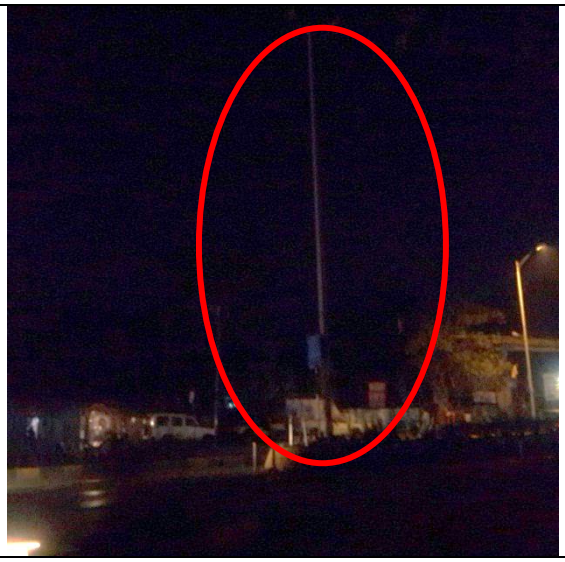
Chainage 3/600 m and 3/700 m RHS side18.481847, 73.857473: The thermoplastic painting at road edge, between lanes in the BRTS corridor as well as main carriageway is faint/faded and lacks adequate reflectivity.



Chainage 4/800 m and 3/700 m LHS 18.478082, 73.857344: BRTS bus stop near Market Yard Junction and near Padmavati junction lacks any lighting arrangement. The BRTS corridor also lacks any street lighting arrangement thereby putting pedestrians to risk when crossing the road during night time.



Chainage 5/500 RHS side18.496377, 73.858213: Completely dark footpath and cycle track near Laxminarayan junction. The defunct street light poles and high mast poles should be made functional.



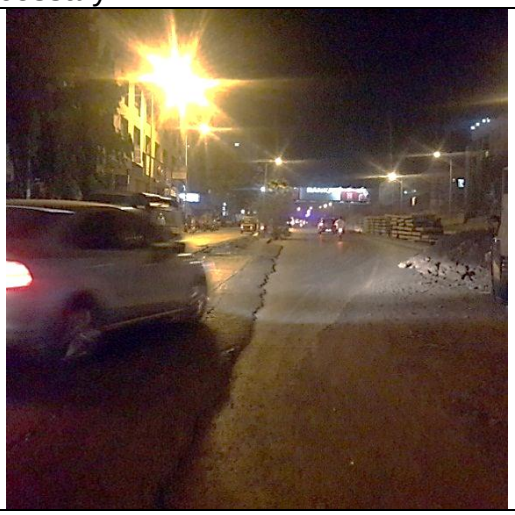
Chainage 4/850 Coord: 18.488380, 73.857269: High mast pole near Parvati Industrial estate junction completely shut down creating a dark intersection

Chainage 3/100 RHS side18.472608, 73.856325: Sudden reduction in the carriageway by barricading without adequate warning needs to be rectified by erecting advanced warning signs at the start of construction area of Dhankawadi flyover. The reflectors/ reflective material on the barricades are not enough to clearly mark the restricted carriageway width. Traffic blinkers and directional indicators need to be installed to guide vehicles.

Chainage 3/000 RHS side18.471570, 73.856947: Exposed reinforcement of ramp wall at the approach to flyover along the main carriageway near Shankar Maharaj

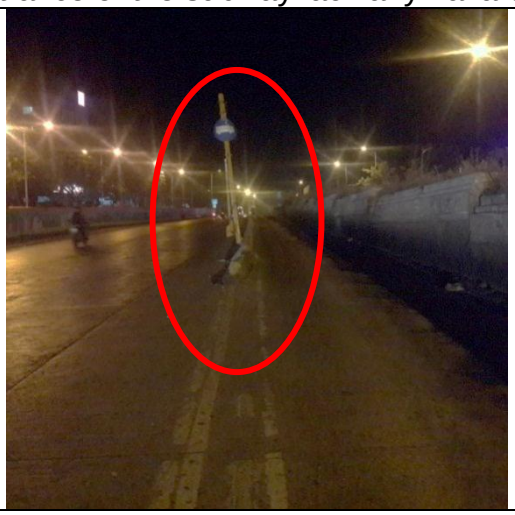
Math has to be barricaded. There is no clear demarcation by paint etc to direct the vehicles away from the ongoing construction work. There are no reflectors, reflective tape etc to clearly mark the ongoing construction work. This creates hazardous conditions for two wheelers as the reinforcement steel is at a low level and may cause serious injury to the two wheeler rider.

Chianage 2/700 RHS side18.464080, 73.857805: Addition of reflectors, blinkers along the construction barricading to offset the poor lighting arrangements is urgently necessary.

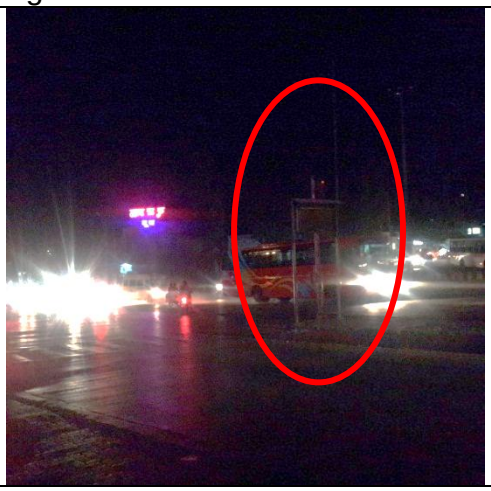


Chainage 2/450 RHS side: Poor condition of the carriageway, restricted width of the road due to barricading and inadequate traffic safety measures at ongoing construction site during night time creates difficult scenario for driver and other road users. At the location near petrol pump at Dhankawadi, there is lack of separate pedestrian space and constricted carriageway and bus stop at this location creates a very unsafe travel condition for pedestrians.

Chainage 1/350 RHS side18.460213, 73.858213: Entrance to the vehicular subway to Bharati Vidyapeeth lacks any advance direction signage. The RCC walls at the entrance of the subway lack any hazard marker, retro reflective board etc.

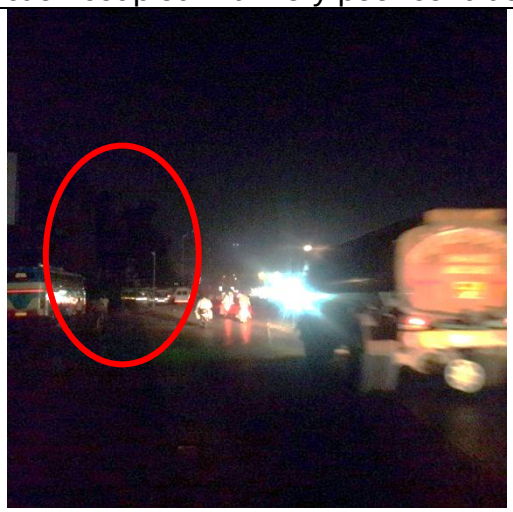


Chainage 1/300 RHS side: The BRTS corridor starting abruptly in front of Bharati Vidyapeeth gate without advanced warning or hazard marker on the kerb / chevron marking etc. Bust stop in front of Bharati Vidyapeeth is without any light arrangement.



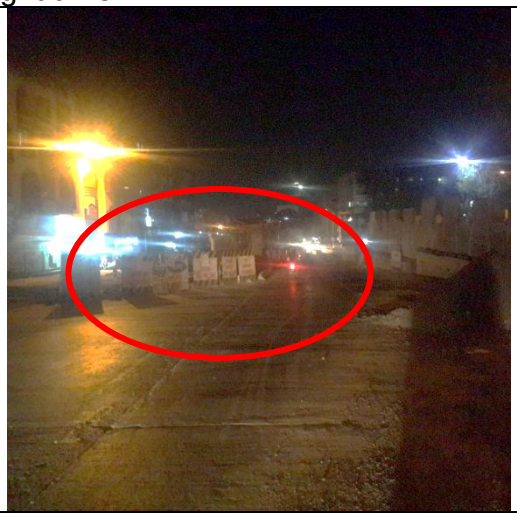
Chainage 0/850 18.460213, 73.858213: Poor illumination at Katraj Dairy junction.- Defunct high mast poles, uncontrolled junction without any chanellization, traffic signal etc pose high risk to all users. There is completely chaotic situation at this

junction coupled with very poor condition of the road pavement.



Chainage 0/950 m LHS side18.455873, 73.858422: Completely dark section between Katraj and Bharati Vidyapeeth without any functional street lighting, high mast poles creating a very unsafe corridor for vehicles and especially for pedestrians.

Chainage 0/110 m18.448688, 73.857993: Completely uncontrolled Katraj junction at intersection of Pune Satara Road and Dehu Road Bypass. Traffic control measures need to be urgently implemented during the night time.



Chainage 2/500 m LHS side18.463730, 73.857778: Lack of adequate night time safety measures like reflectors, blinkers, advanced direction broads and hazard markers at the ingoing construction near Dhankawadi Bus route junction

Chainage 2/900 m LHS side18.470894, 73.857006: Sudden reduction in carriageway width due to ongoing construction near Shankar Maharaj Math without any advanced warning sign. Vehicles moving at high speeds on the down slope unexpectedly encounter the barricading with inadequately marked steel barricades with poor illumination.

Chainage 3/200 LHS side18.475127, 73.855997: RCC pipes and excavated stuff lying on the carriageway without advanced warning signage or proper safety measures will tend to create accident spot.

Chainage 5/600 LHS side18.497228, 73.857842: The barricading for ongoing construction of flyover near Swargate junction lacks any advanced warning sign of construction zone. The construction safety measures during night time are meagre and need improvement with adequate number of reflectors, traffic blinkers reflective tapes proper barricading etc.

Observations and Conclusions

Based on the field study of the audit team, the following conclusions are derived.

1. The ongoing construction activities along the entire corridor have severely restricted the functionality of the segregated BRTS reducing it to between 35 to 37 % of the original length of the BRTS corridor. There is lack of strict enforcement due to which use of BRTS route by all vehicles is common. Lack of discipline combined with speeding and overtaking in the BRTS corridor by vehicles other than BRT buses is also rampant and has already led to number of accidents on many occasions. BRT buses exit the BRT corridor at high speeds at locations where the corridor is discontinuous and merge with the mixed traffic.
2. There are many locations where the BRTS corridor is discontinued due to ongoing construction and also at minor road crossings. These locations are highly unsafe and accident prone due to fast moving buses trying to merge with the other vehicles at such locations. These locations have also created spaces for smaller vehicles to cross the BRTS corridor thus reducing the speed of the buses even at locations other than the major junctions.
3. There is inadequate traffic signal system at smaller openings on the BRTS corridor.
4. The access to most of the bus stops is poorly maintained.
5. The level of self-discipline amongst the road users is highly questionable. The road users especially two wheelers riders try to create shortcut paths across the road leading to accidents. The tendency to adhere to the traffic signals, speed limit restrictions, and prohibition into BRTS lanes is also meagre.
6. There are inadequate and unsafe pedestrian facilities along the length of the corridor especially along the construction stretches.
7. There is significant lack of enforcement on footpath/ cycle track encroachments and parking.
8. The road markings for traffic delineation are absent or severely below acceptable level of serviceability.
9. The existing main carriageway, service road is in poor and damaged condition in significant length of the road. There are wide longitudinal gaps in the

carriageway at some locations along with haphazard and unmarked obstructions.

10. The storm water chambers are in a state of disarray with chamber covers sagged, settled or protruding above the road surface. The area around the chambers is not levelled causing difficult driving conditions and sudden jerks on the road.Their continuity needs to be verified before monsoon.
11. The inaccessible footpaths and cycle tracks (discontinuities)have led to some unutilized spaces on service road and also on the footpath and cycle track.
12. Use of footpath and cycle track for commercial activities like loading and unloading of commercial vehicles results in pedestrians occupying the main carriageway, thereby reducing the vehicular carriageway width.
13. Missing links in cycle tracks and footpaths especially near junctions results in pedestrians using the main carriageway and also results in a loss of valuable carriageway space.
14. The physical condition of footpaths is poor due to missing paver blocks, debris, extended commercial activities, etc. The facilities for physically challenged / differently enabled persons like access ramps for wheel chairs etc are missing or in unacceptable conditions.
15. Utility cross and continuous longitudinal cuts are unattended along the project stretch at many locations thus severely restricting driving conditions.
16. There is inadequate warning signage, barricading at ongoing construction projects. There are no separate traffic control personnel deployed at any of the ongoing construction projects by the contractor. In order to avoid any audit queries regarding the traffic barricading, diversion measures and the cost involved, it is a tendency of PMC to avoid adopting proper measures for traffic diversion, barricading during the construction phase.
17. There is lack of adequate safety measures and illumination during construction sites.
18. There are non-functional street lights especially in the footpath area time creating long dark and unsafe spaces along the road.
19. The pavement condition of main carriageway at Katraj Zoo junction, Balajinagar junction is very poor.

20. The junctions at Katraj Zoo and Katraj (highway) Junction are unregulated and unsafe especially at night.
21. The removal of traffic island for the upcoming flyover work at the Swargate junction has created a wide unregulated and un channelized space creating a nightmare for all road users alike.
22. There is absence of lighting arrangements at Bus stops and along the BRTS corridor at most length.
23. There are sheared steel railings at some locations along the BRT corridor.
24. In some length of the Dhankawadi flyover construction site, the retaining wall with exposed reinforcement steel is unprotected.
25. There is lack of adequate safety measures for labours and road users at the ongoing construction sites.

Recommendations

Based on the site visits, study of the existing project drawings, the following recommendations are made. It is recommended to implement the proposed suggestions in a phase wise manner. Immediate implementation is ***Phase I*** and intermediate implementation is designated as ***Phase II***

1. As stated in this report, due to ongoing construction works, the original continuous BRTS corridor which was functioning effectively has become discontinuous at various construction sites. This has resulted in buses from the dedicated corridor merge with other vehicles at high speed. It is recommended that traffic calming measures like speed breakers, reflectors, signage, retro reflective taping etc shall be provided at such locations to reduce the speed of merging buses to match the respective speed of other vehicles. These measures shall be effectively monitored until completion of various ongoing projects (***Phase I***).

   As soon as the construction of new project is complete and functional the segregated BRTS corridor shall be reinstated as was originally planned ***(Phase II)***.
2. Adequate traffic signals shall be installed on the BRTS corridor after reinstatement ***(Phase II)***.
3. The unwarranted breaks in the BRTS corridor at minor road crossings should be plugged ***(Phase I)***.
4. The access to all bus stops shall be properly designed and maintained ***(Phase I)***.
5. A separate initiative is required on part of PMC, Traffic police department, NGO's involved in pedestrian safety work to sensitize the general public in obeying traffic rules and regulations ***(Phase I &Phase II)***.
6. A rethinking in the footpath designing is essential. It can be noted that at every break of foot path step is encountered. Ideally at every discontinuity in the footpath (due to property access or cross road etc) exist and entry ramp should be provided. These small improvements encourage the pedestrians to use foot path. It is observed that most of the pedestrian are reluctantly rather forced to use road carriageways due to presence of steps at frequent intervals even on well maintained footpaths. A holistic approach shall be enforced to

design and implement safe pedestrian facilities which include footpaths and raised pedestrian crossings ***(Phase II)***.

7. Adequate traffic wardens shall be deployed by appropriate authorities to curb unauthorized use of footpaths and cycle tracks. **Adequate safety measures like detectable edging for pedestrians (clearly distinguishable alternative space or temporary walkway for pedestrians well segregated by MS barricading) shall be deployed at construction zones to facilitate** pedestrian movement. Adequate personnel from respective departments shall be deployed to evict encroachers like hawkers, hutments and extended commercial activities ***(Phase I)***.
8. Permanent road marking in thermoplastic paint with adequate reflectivity as per norms shall be provided in the stretches where construction activity is absent. Temporary road markings (ordinary road paint) shall be provided in the construction zones ***(Phase I)***.
9. Activities like resurfacing with proper levels of damaged carriageway portions shall be undertaken immediately along with reinstatement of kerbs and medians. Excessive care to be taken when levelling at portions where there is a level difference between the BT and concrete corridors and also where longitudinal gaps are located ***(Phase I)***.
10. Damaged, protruding and sagged storm water chambers shall be immediately repaired or raised / lowered to the level of the resurfaced corridor. Damaged chamber covers shall be replaced ***(Phase I)***.
11. Missing links in footpaths and cycle tracks shall be restored immediately to maintain possible continuity of footpaths and cycle tracks during construction of various projects ***(Phase I)***.
12. Use of footpath and cycle track for commercial activities like loading and unloading of commercial vehicles shall be strictly banned and enforced ***(Phase I)***.
13. Linking of walking areas at intersection of cross roads and main corridor shall be restored by removal of the obstructions like poles, cables, utility boxes etc ***(Phase II)***.
14. The physical condition of footpaths shall be immediately improved to acceptable standards at to ensure that pedestrians access only the footpaths

and do not spill over onto the main carriageway. The footpath network should be made accessible to physically challenged/ differently enabled persons by provision of appropriate measure especially at the junctions ***(Phase I)***.

15. The utility vendors shall ensure that adequate safety measures are adopted during the excavation activity. Barricades, blinkers, reflectors, warning signages, direction indicator barricades, flashing warning beacons, hazard markers, and necessary traffic wardens shall be deployed by the utility contractor. Compliance shall be enforced by receiving Request for Inspection (RFI) note from the utility contractor for any activity that he proposes to commence and he shall also compulsorily notify the concerned PMC Department on completion of the activity in order to reinstate the trench at the earliest by PMC. Utility vendors shall be forced to get the approval of the location where road crossing is proposed. It is recommended that it shall not be at the centre of intersection but immediately after / before the open intersection area ***(Phase I)***.
16. The construction contractors at ongoing constructions shall enforce that adequate direction indicator barricading, directional signage, warning signs, arrow boards,portable traffic signals, priority signs, flashing warning beacons, hazard markers. Separate traffic control personnel, flagmen with retroreflcetized vests at all times (especially during night) shall be provided immediately. A lateral buffer space (space between vehicles and work space) of minimum 300 mm shall be maintained along the worksite. Semi-permanent type measures (e.g New Jersey type barriers for segregation) which can give good service during the construction phase should be adopted by PMC to avoid creating unsafe conditions for road users and construction personnel ***(Phase I)***.
17. The concerned department of PMC shall ensure the functionality of all street lights and high masts and shall augment wherever required especially at construction zones. Proper illumination levels shall be maintained in construction zones ***(Phase I)***.
18. Special care shall be taken to ensure functionality of street lights especially in the footpath areas during the night time ***(Phase I)***.

19. The pavement shall be reinstated and resurfaced at the Katraj Zoo and Balaji Nagar junction on an urgent basis. The footpath surfacing shall be in proper level at the entrance to Katraj Zoo as visitors throng the premises and a majority are small children who may face mishaps ***(Phase I)***.
20. The traffic signals at Katraj Zoo and Katraj Junction shall be made operational throughout the day and night times as these are located at the entry point to Pune City ***(Phase I)***.
21. Traffic calming measures like speed breakers, humps, speed tables / raised crossings, channelizes / traffic islands shall be constructed immediately to slow down and channelize the haphazardly moving traffic at the Swargate junction. New Jersey type barriers (precast RCC movable barriers) as recommended by IRC may be used for the traffic segregation. The movement of S.T. buses exiting the terminus towards Satara side shall be signalized to avoid confusion and inconvenience to other road users. The parked auto rickshaws and hawkers on either side of this road stretch shall be immediately evicted and temporarily dedicated rickshaw stands shall be demarcated at Swargate junction during ongoing construction ***(Phase I)***.
22. The existing sheared railing in Dhankawadi area shall be replaced wherever necessary ***(Phase I)***.

    Special BRTS railings shall be installed after reinstatement of BRTS on completion of projects ***(Phase II)***.
23. Restoration of barricading with immediate effect shall be enforced along the length of the retaining wall under construction with exposed reinforcement steel at Dhankawadi flyover construction site. It is recommended to provide segregated pedestrian passage by erecting MS barricading in every ongoing construction zone ***(Phase I)***.
24. The construction contractors at ongoing construction works shall enforce proper safety measures for labours like safety nets, protective gear, safety belts and for road users like lateral vehicle clearance zone and separate pedestrian space immediately. The contractors shall be asked to carryout internal safety audit at appropriate intervals during construction period ***(Phase I)***.
25. It is recommended that PMC shall think on following :

One has to accept the reality that the road widths of even the arterials routes in the City are inadequate to accommodate the present increased volume of traffic and huge increase in coming years. And also it will be a difficult task to increase the existing widths. Under these circumstances rethinking on provision of separate cycle track at different level is needed. It is reported that the cycle population in the city has dwindled down to the extent of almost extinction. (actual survey on this road stretch may be conducted in case of doubt, un-motorized transport is welcome but reality is far different). This space can be utilized for better footpaths ***(Phase II)***.

As the above work needs to be carried out in a timely manner, a detailed list of the concerned departments involved in compliance is attached with the report.

For Creations Engineers Pvt. Ltd.

CREATIONS ENGINEERS PVT. LTD. Project Management Consultants PUNE

Mohan Sakhalkar
Managing Director

For Pavetech Consulting Engineering Services Pvt. Ltd.

PAVE TECH CONSULTING ENGINEERING SERVICES PRIVATE LIMITED PUNE-5.

Vikas Thakar
Managing Director

List of recommendations and concerned stakeholder

Sr. No	Recommendation	Phase (immediate/ intermediate)	Concerned stakeholder
1	Traffic calming measures in existing BRTS merging/ demerging locations	Immediate	JNNURM II of PMC
2	Reinstatement of BRTS corridor	Intermediate	JNNURM II of PMC
3	Installation of adequate signals	Intermediate	JNNURM II of PMC & Electrical Dept of PMC
4	Plugging of breaks in BRTS	Immediate	JNNURM II of PMC
5	Design, execution and maintenance of access to all Bus Stops	Immediate	JNNURM II of PMC
6	Public awareness initiatives	Immediate as well as intermediate	PMC along with Traffic Police Department and active NGO's
7	Repair of the footpaths and pedestrian crossings	Immediate	JNNURM II of PMC
8	Redesigning of footpath and cycle track connectivity's and pedestrian facilities	Intermediate	JNNURM II of PMC
9	Wardens for enforcement of unauthorized parkings	Immediate	PMC along with Traffic Police Department
10	Providing pedestrian access along the ongoing construction projects	Immediate	Concerned contractor and execution Dept of PMC/ MSRDC etc
11	Thermoplastic road markings	Immediate	Concerned contractor and execution Dept of PMC/ MSRDC etc
12	Resurfacing activities for cross cuts, longitudinal cuts and damaged ramps etc	Immediate	Road Department of PMC
13	Rectification of damaged SWD chambers and covers	Immediate	Road Department of PMC
14	Linking of walking areas on main road and adjacent road	Intermediate	JNNURM II of PMC
15	Utility vendors to enforce adequate safety measure	Immediate	Utility vendor to enforce measures and PMC to monitor strictly
16	Improvement in work zone traffic	Immediate	Concerned

Sr. No	Recommendation	Phase (immediate/ intermediate)	Concerned stakeholder
	management and safety of work site		contractor and execution Dept of PMC/ MSRDC etc
17	Functionality of all street lights and high mast	Immediate	Electrical Dept of PMC
18	Traffic signals at junctions during night tome	Intermediate	Electrical dept of PMC/ Traffic Police Dept
19	Traffic calming at work zone and non BRTS area	Immediate	Concerned Department of PMC with Traffic Police department
20	Rectification of sheared railing	Immediate	JNNURM II of PMC
21	Redesign of railing for BRTS corridor	Intermediate	JNNURM II of PMC
22	Barricading along exposed RCC sections	Immediate	Concerned contractor Dhankawadi Flyover/ JNNURM II of PMC