FINAL DETAILED PROJECT REPORT

INTERSECTION REDESIGN

RAJGHAT INTERSECTION
NEW DELHI
INTERSECTION REDESIGN

Preparation of design proposals for tactical interventions followed by execution to improve the safety and mobility of the Rajghat Intersection

FINAL DETAIL PROJECT REPORT

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EXECUTIVE SUMMARY

Road safety is a public health emergency, endangering lives and livelihoods globally. The issue of loss of lives due to road crashes is one that is in need of immediate attention. Within the cities in India, New Delhi records the highest number of road crashes fatalities. The Zero Fatality Corridor (ZFC) model, which originated in India and was developed by the SaveLIFE Foundation (SLF), is a road traffic safety model relevant for low- and middle-income countries. This model aims to reduce the number of road crashes and consequent injuries, damages and fatalities. This initiative aims at creating a scientific, evidence-based model of road safety that prevents deaths at the local level and is both scalable and replicable, within India, as well as in similar contexts globally.

The Delhi Zero Fatality Corridor journey began with the initial signing of a Memorandum of Understanding (MoU) between SLF and the Transport Department of the Government of the National Capital Territory of Delhi in 2018, and was later extended in 2020. As a part of this project, the Rajghat Intersection in New Delhi was selected for the deployment of Tactical Urbanism trials to enhance the safety of all road users at the Intersection, especially the most vulnerable ones. The four-armed Rajghat intersection in the vicinity of Rajghat—a national memorial dedicated to Mahatma Gandhi—includes a crossing of three roads, namely, the Jawaharlal Nehru Marg, the Mahatma Gandhi Marg, and the Satyagraha Marg. The approaches of this Intersection are directed towards Rajghat, ITO, Shantivan Chowk and Daryaganj. This report captures the philosophy, approach, process, findings and impact of the Rajghat trials.

In March 2021, the site work was commissioned to JUSF and was kickstarted with a detailed topographical survey capturing all existing physical features of the intersection, including details on travel lanes, footpaths, medians, pedestrian crossings, property boundaries, gates and the existing vegetation. These details were employed for analysis and design development. In March, 2021, through cameras installed especially for the purpose, a traffic survey was conducted that captured the traffic movement to and from all four arms of the intersection. On the basis of the data collated by extrapolating these counts, the peak and non-peak hours were selected to better understand the traffic trends, for both vehicular and non-motorised modes of transport at the Intersection.

The surveys revealed that the three free lefts at the Intersection with no break in the vehicular traffic movement, promote over-speeding, while the access lanes opening out onto the Intersection, result in chaotic vehicular traffic movement, thereby endangering pedestrians. The other concerns that came to the fore included insufficient, poorly designed and inaccessible pedestrian refuge islands, lack of signages, poorly-designed pedestrian crossings and inadequate lighting and visibility at the Intersection.

The process of planning, approval and advocacy for implementation stretched over six months and culminated in the execution of the Tactical Redesign, inaugurated on 23 November, 2021. The temporary cost-effective interventions aimed at testing the design and transportation planning at the Rajghat Intersection included changing the layout of the stretch as per the technical plans prepared by employing equipment like traffic cones and plastic barriers to reduce conflict points and to ensure safe movement for all road users. Similarly, paint was used to segregate the public-pedestrian realm from the vehicular realm. Paint was also employed to create a gradual effect which pre-informed the vehicular traffic of an approaching zebra crossing, to aid informed decision making to consciously reduce their speed. In order to further segregate the pedestrian and vehicular realms, planters were employed.

A detailed, third-party, independent impact analysis for the redesign was also conducted during the trials. Urban AI, an AI-based road safety audit platform, was used to conduct the analysis. The impact analysis revealed that the interventions have reduced the overall vehicle-to-vehicle conflicts by over 81%. Further, in mode-wise conflict with pedestrians, a 38% reduction in conflicts with four-wheelers and a 33% reduction with two-wheelers, was witnessed.

Following this analysis and the user feedback collected during and post the interventions, a set of constructive recommendations have been presented in this report, aimed at making the Rajghat Intersection a safe, shared space for all types of road users, especially the vulnerable ones. Modal equity at junctions is an outcome that can improve safety and save lives. The success of the safety measures designed and infrastructural changes at the Rajghat Intersection will only be possible through the sustained collaboration of all stakeholders, including the Public Works Department, Delhi Traffic Police, and the Transport Department to execute and maintain the permanent infrastructure and design changes.
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1. INTRODUCTION
1.1. Project Details

The Rajghat Intersection in New Delhi is considered one of the busiest in the capital city, as it serves as a common point for many road users traversing through it for work, educational and recreational purposes. SaveLIFE Foundation (SLF), an independent, non-profit organisation, commissioned Jana Urban Space for Tactical Urbanism trial design consultation at the Rajghat Intersection.

These trials tested out site-specific urban design, planning and infrastructure changes on a temporary basis. The interventions were aimed at increasing safety for all road users, especially the most vulnerable - pedestrians, cyclists and other non-vehicular transport users.

The threefold redesign strategy is aimed at:

Firstly, showcasing the proposed design using tactical interventions for a one-month period.
Secondly, conducting an impact assessment of the intervention.
Thirdly, permanently rebuilding the intersection as per the proposed design for improved efficiency and road safety, and to create a landmark public space in the city.

**Key Proposals for Intersection Redesign**

1. Improved geometry - for efficient movement of traffic with reduced wait times
2. Adequate turning radii - to prevent over-speeding while allowing large vehicles comfortable access
3. Improved visibility - for both motorists and pedestrians
4. Safe crossings - refuge islands for pedestrians and cyclists
5. Creating accessible and barrier-free intersections for the old, young, physically challenged and visually impaired
6. Traffic calming measures
7. Improved lighting
8. Improved signage and legible wayfinding
9. Reclaiming public space for the city - landmarking and branding

**Approach and Methodology**

**Stage 1**

Included studying and understanding the local context of the selected Intersection at Rajghat and setting a vision for its redevelopment via:

1. Surveys, studies, data collection and analysis of the topography, traffic volumes, speeds, waiting times, pedestrian safety, points of conflict and site reconnaissance
2. Vision for redevelopment
3. Conceptual design options

**Stage 2**

Included the selection of one of the concept designs to be implemented on the site as a Tactical Urbanism intervention. This step was followed by an impact assessment by an independent third party.

**Stage 3**

The third and final stage provided construction details of all or select Tactical Urbanism interventions from stage 02, guided by the impact assessment, to provide for a more permanent redesign for the intersection with a focus on safety and vibrancy.
1. 2. Vision Summary

To create a vibrant, dynamic and accessible Intersection with enhanced pedestrian safety and sensitivity towards local patterns, whilst still allowing for efficient vehicular movement. This will be achieved through a series of tactical and permanent interventions based on rigorous data collection, analysis and an impact assessment.

To design for the safety of pedestrians and cyclists, by ensuring minimum wait times, safe refuge areas, retro-reflective markings, signages and sufficient lighting.

To ensure barrier-free access for the old and young, as well as those who are physically or visually challenged.

To design for the local context and respect the land use around the Intersection - national landmarks and premier institutes, in a manner that it is reflected in the proposed designs.

To design a safe Intersection that is also a vibrant public space, and to integrate it with the nearby tourist attractions.

To design traffic calming and pedestrian safety measures without compromising on efficient vehicular movement at the Intersection.

To design for good lighting with no black spots, continuous activity, surveillance, visibility and porosity. To encourage equal participation of all genders with improved safety.

Figure 2. Vision for the Rajghat Intersection
Figure 3. Design elements
1. 3. Design Methodology

GUIDING PRINCIPLES

The redesign was guided by the principles of safety, geometry and activity.

(i) Safety - To ensure safe crossings, including refuge areas, good lighting, surveillance, legible signage, wayfinding and universal accessibility.

(ii) Geometry - To clean up the geometry of the intersection and provide for traffic calming measures, remove all conflict points and minimise the possibility of crashes and fatalities.

(iii) Activity - To activate the intersection with vending and seating options, as well as public art and spaces for recreation, to thereby improve the overall safety of the intersection.

Figure 4. Guiding principles
1. 4. Scope of Work

To organise and conduct temporary urban interventions, called Tactical Urbanism trials at an accident-prone junction at Rajghat, the following measures detailed below were undertaken:

01 **Topographical Survey**
A detailed topographic survey was carried out which identified all landscape, streetscape, and built form within a 200 m radius from the center of the junction.

02 **Site Reconnaissance**
A site reconnaissance was conducted to gain an understanding of the scale, site topography, traffic movements, environment, site connections, and civic infrastructure.

03 **Traffic Surveys**
A 12-hour traffic survey was conducted that captured the number and types of vehicles during 15-minute periods on all arms of the junction. Vehicular speeds were also recorded. The survey included a record of pedestrian volume at all crossing points during peak and non-peak hours, in addition to the traffic surveys. Both day-time and night-time observations are a part of this survey.

04 **Transport Studies**
Transport studies were conducted to understand circulation patterns, movement patterns, activity mapping, user behaviour and shade studies.

05 **Data Analysis**
To identify vehicle conflict points and movement patterns, as well as pedestrian conflicts and safety issues at the current pedestrian crossings at the junction, data was collected using video analysis and traffic/transportation reports.

06 **Safety Audit**
A detailed safety audit was conducted with the help of plans drawn after the topographical survey. The safety aspects related to Vulnerable Road Users were studied in detail as they are the majority victims of road crashes. Condition, requirements, availability, appropriateness, retro-reflectivity, and visibility of road signages and road markings present at/near the project site were also studied.

### ANALYSIS AND VISION REPORT

01 **Data Analysis**
All the collated data was analysed to guide and derive the vision and the proposed concept design for both the Tactical Urbanism interventions as well as the subsequent construction proposal.

02 **SWOT Analysis**
Based on the studies and surveys, the challenges and potential of the site were derived.

03 **Vision**
An initial exercise was undertaken to redesign the junction. This vision explained the aspirations in a concise manner and provided a basis for developing the concept design. Design development principles were created which assisted in guiding the preparation of the concept design in line with the vision.

04 **Concept Design**
The detailed concept design captured the vision and objectives of the project.

05 **Design Drawings and Cost Estimates**
The Tactical Urbanism Detail Design Report takes forward the selected concept design option and provides the details, drawings and cost estimates required to implement the Tactical Urbanism trials at the Rajghat Intersection.

The Tactical Urbanism trials were conducted at Rajghat in November 2021. The independent impact assessment was conducted by a third-party agency specialising in AI technology for transportation.

06 **Design Drawings and Cost Estimates**
Based on the impact assessment, good-for-construction drawings of the proposed redesign of the Rajghat Intersection have been provided in this report.
1. 5. Site Appraisal

Site Context

The Rajghat Intersection is located at the junction of the Mahatma Gandhi Marg with the Jawaharlal Nehru Marg and the Satyagraha Marg.

Rajghat is a memorial dedicated to Mahatma Gandhi, and is also the place where he was cremated. The location also includes memorials dedicated to Jawaharlal Nehru, Indira Gandhi, Sanjay Gandhi, Rajiv Gandhi and Atal Bihari Vajpayee, among others. The National Gandhi Museum and Library is one of the other prominent landmarks near the junction.

The closest metro station is Delhi Gate, on the Violet Line, located 1 km away.

There are several bus stops within a 500 m radius of the Intersection.

There are no active users or residential buildings adjacent to the junction.

The Red Fort is located north of the Intersection.

Connaught Place and India Gate are 4 km away from the Intersection.

The Intersection currently witnesses heavy vehicular traffic volumes and is not pedestrian friendly. It is also fairly unsafe, especially after 6:00 pm.
Crash Data Analysis

Based on the data from the traffic police, for the years 2018, 2019 and 2020, the map on the right and the table and graphs below have been prepared.

The map clearly shows that most crashes happen in the middle of the intersection and few on the roads. Of these, maximum road crashes are seen at the Mahatma Gandhi Marg (north).

The table on this page shows the crash data by year. The number of crashes and fatalities have halved from 2018 to 2020. However, there is still at least one fatal accident every year.

Note: Data on whether the fatal accidents involve pedestrians is unavailable.
2. SITE ANALYSIS
2. 1. Existing Situation Analysis

Site Reconnaissance

L-SECTION FROM CH:-0.0 TO CH:-249.277

L-SECTION FROM CH:-0.0 TO CH:-249.057

L-SECTION FROM CH:-0.0 TO CH:-266.693

L-SECTION FROM CH:-0.0 TO CH:-265.838

A team visited and studied the site extensively. The photographs on the following page highlight the existing features, challenges and potential of the site, as well as the need for urgent redesign.
Figure 7. This photograph taken early in the morning, shows poorly designed pedestrian crossings and vehicular stop lines, as well as missing signboards.

Figure 9. The elements pictured here include a poor quality pedestrian refuge, lack of accessibility for the physically and visually challenged, access road opening up onto the intersection, and a free left promoting over-speeding and rash driving.

Figure 11. The image displays a poor quality footpath, further reduced by encroachments. The intersection is lined with passive edges—blank compound walls which makes it unsafe at night, especially for women.

Figure 8. Photographed here is the SPA Service Road which runs parallel to the Mahatma Gandhi Marg. It opens out onto the intersection causing conflict issues. The footpath, pushed further away from the road, has no lighting and is unsafe. The effective width of the footpath has been compromised by the trees there.

Figure 10. This image displays a curb cut designed for universal access where the footpath has been encroached upon with traffic barricades and potted plants.

Figure 12. Photographed here are poor quality refuge islands and unclear paint markings which significantly reduce road safety.
2.2. Topographical Survey

The topographical survey of the Rajghat Intersection was conducted in March 2021. It captured all existing physical features of the Intersection including travel lanes, footpaths, medians, pedestrian crossings, property boundaries, gates and existing vegetation. The levels of the Intersection were captured, and two temporary bench marks were established on the site. The topographical survey has been showcased in the plan on the right.
2. 3. Traffic Studies

Traffic Volume Count

12-HOUR TRAFFIC VOLUME

A 12-hour video of the traffic movement to and from all the four arms of the Intersection was captured on 16 March, 2021, and the counts were extrapolated from the same. The videos were taken between 6:00 am and 11:00 am and 3:00 pm and 10:00 pm. These specific slots were selected to cover all peak and non-peak/late hours to better understand the traffic trends of both vehicular and non-motorised modes of traffic at the Intersection, while adhering to the 12-hour requirement. The graph on the right depicts the volume count of the different modes of transport including the pedestrians and bicycles at these times.

Motorised Vehicles - It is evident that vehicular traffic volumes are far higher in the evening as compared to the morning, especially for four-wheelers and two-wheelers. The maximum volume of four-wheelers was seen between 6:00 pm and 8:00 pm--reaching as high as 5000, followed by two-wheelers between 4:00 pm and 8:00 pm, peaking at 4073. Autorickshaws were seen to have a fairly constant volume throughout the day, peaking at a count of 2230 at 10:00 am. Heavy vehicles including buses had a low volume in the morning, and higher volumes between 3:00 pm and 6:00 pm, peaking at a count of 1400, around 5:00 pm.

Non-motorised Transport - The volume of pedestrians and cyclists was seen to be quite low at the Intersection. Pedestrian volumes were higher in the morning, peaking at 500 around 9:00 am. Low pedestrian activity was witnessed in the area post 6:00 pm. Cycle volumes were comparatively low throughout the day with a maximum of 236 cycles being recorded in the morning between 9:00 am and 10:00 am.

Figure 14. 12-hour traffic volume
Traffic recordings were used to calculate the vehicular traffic volume intensity. The highest vehicular volumes were seen travelling from (C) Mahatma Gandhi Marg (north) to (B) Jawaharlal Nehru Marg (travelling west). The second highest traffic volume was seen from (B) Jawaharlal Nehru Marg to (A) Mahatma Gandhi Marg (south) and from (C) Mahatma Gandhi Marg (north) to (A) Mahatma Gandhi Marg (south). Vehicular traffic to and from Satyagraha Marg was the least.

The pedestrian and bicycle traffic volume intensity was highest between the Mahatma Gandhi Marg (north) and (south) (A-C). The second highest volume was between Jawaharlal Nehru Marg and Satyagraha Marg, (B-D) in the (east) and the (west) direction. The least traffic volume intensity was witnessed between Mahatma Gandhi Marg (north) and the Jawaharlal Nehru Marg (west) and Satyagraha Marg (east). (C-B, C-D, B-D)
Mode-wise Traffic Intensity Distribution

The pie-charts on this page show the percentage distribution of the different modes of transport for all the arms at the Rajghat Intersection. The maximum four-wheeler traffic was experienced from Mahatma Gandhi Marg (north) with a share of 75%. The bus traffic was highest from Satyagraha Marg due to the presence of a Delhi Transport Corporation (DTC) Depot. Mahatma Gandhi Marg (north) was seen to be experiencing the highest traffic across majority of the means of transport. The Jawaharlal Nehru Marg had a significantly higher volume of auto-rickshaws as compared to other means of transport due to the presence of the Delhi Gate Metro Station.
Peak Hours Traffic Volume

The traffic volume on each arm of the junction for the morning and evening peak hours is illustrated here.

**Morning Peak Hour** - The maximum vehicular traffic volume from (C) Mahatma Gandhi Marg (north-south) was witnessed during morning peak hours between 9:00 am and 10:00 am, with a 2076 count of four-wheelers, 1581 count of two-wheelers and 655 count of auto rickshaws. The lowest traffic volume was witnessed from (D) Satyagraha Marg for two-wheelers and auto rickshaws with a 250 count of two-wheelers and less than 100 for auto rickshaws. The lowest traffic volume for four-wheelers and buses was from (A) Mahatma Gandhi Marg (south) with less than 100 of each. The pedestrian and bicycle volumes were low even during the morning peak hours. A total of 250 pedestrians from (C) Mahatma Gandhi Marg (north) comprised the maximum count and less than 25 pedestrians from (A) Mahatma Gandhi Marg (south) included the minimum. The maximum number of cyclists, around 100, were recorded from (D) Satyagraha Marg. All other arms had less than 50 cyclists during the morning peak hour.

**Evening Peak Hour** - There was maximum vehicular traffic from (B) Jawaharlal Nehru Marg, with close to a count of 2942 four-wheelers and 2000 two-wheelers during evening peak hours between 6:00 pm and 7:00 pm. The second highest volumes for four-wheelers was from (C) Mahatma Gandhi Marg (north). For two-wheelers it was from (A) Mahatma Gandhi Marg (south). Heavy vehicles including buses had low volumes on all arms at this time, with 250 from (B) Jawaharlal Nehru Marg being the highest. The lowest vehicular volumes at this time were observed from (D) Satyagraha Marg, with around 500 two-wheelers, 250 four-wheelers and less than 100 of the rest. Pedestrian and bicycle volumes were much lower during the evening peak hour than the morning one, with less than 50 seen on all arms. This directly relates to lack of safety and lighting at the intersection.

The above table tabulates the signal data for each approach for both pedestrians and vehicles. The maximum waiting time for pedestrians was seen to be about 130 seconds, and the cycling time was recorded to be around 165 seconds.
Conflict Assessment

This map represents the conflict points between vehicular and pedestrian movements.

01 - There are three free lefts which promote speeding and put pedestrians at great risk, as there is no break in the vehicular traffic movement.

02 - Two access lanes open out on the Intersection, creating chaos in the vehicular traffic movement and endangering pedestrians.

03 - The pedestrian refuge islands are insufficient, poorly designed and lack signage. One of these (at the Satyagraha Marg) is inaccessible.

04 - The entire Intersection suffers from poorly-designed pedestrian crossings and lack of universal accessibility, lighting, visibility and signage.

Figure 19. The access/service lanes open out onto the Intersection, wherein the crossings are discontinued, thereby endangering pedestrians.

Figure 20. The inaccessible median at Satyagraha Marg makes it impossible to cross the road.

Figure 21. This stretch lacks signages and has an unprotected refuge area. The road markings are not as per standard, and stop lines are not visible.

Figure 22. The free left promotes over-speeding and the unscientific crossings fail to meet the refuge island.
Speed Survey

Based on the traffic videos and the time taken for different vehicles to cross the intersection, the average speed of each type of vehicle during the peak and non-peak hours has been arrived at. On the whole, this intersection has a high volume of vehicular traffic, with an average speed of 44 km/hr for four-wheelers and two-wheelers and 36 km/hr for buses.

During the peak hours, vehicles coming from (C) Mahatma Gandhi Marg (north) have the highest speed, capped at 50 km/hr for two-wheelers. Vehicles from (B) Jawaharlal Nehru Marg and Satyagraha Marg (D) have the same average speeds of around 40 km/hr. Vehicles from Mahatma Gandhi Marg (south) (A) have comparatively lower speeds—the lowest being 31 km/hr for buses. On the whole, two-wheelers are the fastest and buses the slowest during peak hours.

During the non-peak hours, vehicles coming from (C) Mahatma Gandhi Marg (north) and (B) Jawaharlal Nehru Marg have the highest speed—the highest being 52 km/hr for two-wheelers. Vehicles coming from (A) Mahatma Gandhi Marg (south) and (D) have similar speeds with an average of 42 km/hr. On the whole, two-wheelers are the fastest and buses the slowest during non-peak hours.
Based on the traffic volume, intensity and speed surveys, it is evident that this intersection witnesses heavy volumes of vehicular traffic at reasonable speeds. Despite the fact that the Delhi Gate Metro Station is less than 1 km away, the pedestrian and cycle volume at the intersection is very low, even during peak hours. This could be a reflection of the unsafe crossings and the lack of refuge areas.

There is little to no non-motorised transport movement at the intersection after 6:00 pm, indicating the lack of safety and activity in the area.

The intersection is located amidst large green stretches including the Rajghat campus and the Mahatma Gandhi Museum. There are close to 30 trees at the intersection, and several more in the vicinity. Most of these are mature trees that provide ample shade. Therefore, the intersection provides a very well-shaded and pleasant experience to both pedestrians and cyclists, especially during the Delhi summers.
Activity Mapping

Despite being close to the heart of the city (4 km from Connaught Place and India Gate), with a metro station (Delhi Gate, serviced by the Violet Line) less than a km away, and with several tourist attractions such as Rajghat (with memorials dedicated to Mahatma Gandhi, Jawaharlal Nehru, Indira Gandhi, Sanjay Gandhi and Rajiv Gandhi, among others, and with the National Gandhi Museum and Library in the vicinity, the Rajghat Intersection, which acts mostly as a point of vehicular traffic thoroughfare, can be a very beneficial public activity space. The graphic on this page explain the challenges and requirements of each user group and the graph on the next page highlights how different user groups use the Intersection throughout the day.
Activity Mapping

From this graph it is clear that vehicles dominate this intersection throughout the day. Pedestrians and cyclists are minimal and do not use the intersection early in the morning or after 6:00 pm. This directly relates to the poor lighting, lack of visibility and safety in the area. Students and tourists too prefer using the intersection sparingly and opt for private vehicles to do so. The intersection lacks any activity or recreational areas to provide a sense of vibrancy and safety.
User Behaviour Analysis

The map below represents the non-motorised transport activity at the Intersection. It is evident that much of the Intersection is a dead space and waiting to cross it, is the biggest activity for pedestrians here. This too stops after 6:00 pm.

User behaviour is directed by the poor design quality and infrastructure at the Intersection, and the lack of activity and safety there.

The proposed action at the site includes working on improved road safety and creating a vibrant public realm without hindering vehicular movement.

Figure 23. Map showcasing non-motorised transport (NMT) activity

Figure 24. The footpath space around the junction is used to park traffic barricades and unload construction materials which hampers the walkability of this stretch. Source: Jana Urban Space

Figure 25. The SPA Service road remains inactive throughout the day. Source: Jana Urban Space

Figure 26. The current infrastructure does not provide safe waiting areas for pedestrians and public transport users, making them vulnerable to road crashes. Source: SaveLIFE Foundation


Safety Audit

Based on the surveys, studies, conflict assessment and crash data analysis, it can be established that this Intersection is unsafe on several counts for both pedestrians and cyclists in general, and women in particular. Some of the major concerns at this Intersection include:

(i) Lack of good quality pedestrian and cycle infrastructure
(ii) Lack of safe crossings and refuge islands
(iii) Lack of lighting and visibility
(iv) Lack of activity and “eyes on the street”

Figure 27. The missing crossings, markings and speed-slowing measures highly compromise pedestrian safety.

Figure 28. The under-lit footpath highly compromises safety, increasing theft vulnerability and possibility of sexual and physical assaults.

Figure 29. Unaligned pedestrian crossings hinder the usage of traffic islands, thereby forcing pedestrians to walk on the travel lanes.

Figure 30. Discontinuous and improper tactile studs hamper the safety of differently-abled users.
Challenges

- Uneven footpaths
- Poor lighting
- Theft
- Accessibility
- No place to sit and relax
- Anti-social activities in evening and late hours
- Open manholes
- Difficulty in wayfinding
- Discontinuous footpath
- Highly inactive in evenings
- Safety over speeding vehicles
- Irregular tactile stud network
- Construction waste lying on footpaths
Despite the fact that the intersection suffers from poor infrastructure, heavy traffic volume and low road safety on all accounts, it holds potential for redesign and strategic interventions. It has both the ready availability of land and the local context to become a landmark intersection in the city, with efficient traffic movement, safe crossings, and an active public realm, with equal participation from women.

Figure 31. SWOT analysis diagram
3. CONCEPTUAL DESIGN
3. 1. Conceptual Design Summary

Existing Issues

2. Free left turns that promote speeding and create major conflict points for pedestrian crossings.
3. There are no priority pedestrian crossing signals (pelican crossings etc.). The paint markings are not as per standard (IRC/others) and lack stop lines for the vehicular traffic.
4. The sufficiently sized refuge island is poorly designed and unprotected from vehicular traffic. It is not at grade and is inaccessible for pedestrians, who are forced to use the carriageway for crossing.
5. At 1500 mm, the refuge island is sufficiently sized but has no bollards or other safety measures.
6. The crossings are not aligned to the refuge island.
7. Access/service lanes opening out onto the intersection create conflict points.
8. The travel lanes are of an average width 3.5 meters. They do not have paint markings to signify stop lines and turning lanes.
9. Continuous compound walls and inactive edges result in an unsafe public realm after 6:00 pm. The intersection is also poorly lit and has many dark patches. No surveillance cameras could be seen.
10. The median is fenced and unusable, making the pedestrian crossing at this point defunct.
11. The refuge island is partially usable due to the existing trees.

Figure 32. Map highlighting the existing issues
Design Evolution

Based on the issues identified, various design ideas were worked out and analysed for site feasibility. Finally, Option 4 emerged as the best fit for the Rajghat Intersection with regard to the issues that needed to be addressed, on the basis of the data analysis. Therefore, this option was further detailed for execution.

**OPTION 01 - COMPACT**
1. Designated and universally accessible crossings with drop curbs, tactile paving and signage.
2. Free left turns reclaimed as public space with seating, vending and other public activities.
3. 3M wide crossings with stop lines, travel direction paint markings etc.
4. The refuge islands expanded to accommodate more pedestrians, protected from vehicular traffic with bollards etc.
5. Access/service lane entry moved to before the Intersection, thereby removing the point of conflict.
6. The wide mouth of the travel lane streamlined to prevent speeding and rash driving.

**OPTION 02 - SIGNALISED**
1. Designated and universally accessible crossings with drop curbs, tactile paving and signage.
2. Free left turns signalised to clam traffic and prioritise pedestrian safety.
3. 3M wide crossings and stop lines, travel direction paints etc.
4. The refuge islands expanded to accommodate more pedestrians, and protected from vehicular traffic with bollards etc.
5. Access/service lane entry moved to before the Intersection, thereby removing the point of conflict.
6. The wide mouth of the travel lane streamlined to prevent speeding and rash driving.
7. Based on traffic volumes to and from the Satyagraha Marg, the existing free left reduced to single lane.

**OPTION 03 - ROUNDBOUD**
1. Designated and universally accessible crossings with drop curbs, tactile paving and signage. Pedestrian crossings to be signalised on demand, for example, pelican crossings.
2. Roundabout lanes of 3.5M with adequate turning radii for continuous flow of traffic.
3. 3M wide crossings with stop lines, travel direction paints etc.
4. The refuge islands expanded to accommodate more pedestrians, and protected from vehicular traffic with bollards etc.
5. Access/service lane entry moved to before the Intersection, thereby removing point of conflict.
6. The wide mouth of the travel lane streamlined to prevent speeding and rash driving.
OPTION 04 - HYBRID

This design option has taken into account all the issues identified. The free left for access to and from the Jawaharlal Nehru Marg are maintained but with reduced width, to act as a traffic calming measure. Continuous pedestrian crossings have also been provided to further enhance pedestrian safety. The free lefts to and from the Satyagraha Marg have been reclaimed as public space. Geometric improvements have been suggested on all sides to improve user experience for all groups. The access/service lanes are closed before the Intersection. This option provides for 1770 Sq. m of public space for the city.

1. Designated and universally accessible crossings with drop curbs, tactile paving and signage.
2. 3M wide crossings with stop lines, travel direction paint markings etc.
3. The medians expanded to accommodate more pedestrians, who will be protected from vehicular traffic with bollards etc.
4. Access/service lane entry moved to before the Intersection, thereby removing the point of conflict.
5. The wide mouth of the travel lane streamlined to prevent speeding and rash driving.
6. Based on traffic volumes, the free left reduced to two lanes.

LEGEND

Reclaimed Public Space - 1770 sq.m
TOTAL AREA OF INTERVENTION - 9655 Sq.m

Figure 36. Design option chosen for execution: Hybrid
Site Circulation

The map to the right showcases vehicular circulation post design execution. It illustrates how the proposed design will not hinder or impede vehicular movement. The traffic lanes were decreased by 20% to accommodate refuge areas and increase pedestrian safety. The uniform travel lanes further discourage speeding and rash driving.

Note: The map on the right shows the conceptual proposal, as submitted on 4th May, 2021. The updated final plan has been submitted on 10th November, 2021. Please refer “Figure 42. Final Design Plan: Tactical urbanism” on page 44.

Figure 37. Proposed vehicular circulation
Site Programming

The map to the right showcases how different users will move safely across the Intersection, in the proposed design.

Note: The map on the right shows the conceptual proposal, as submitted on 4th May, 2021. The updated final plan was submitted on 10th November, 2021.

Please refer “Figure 42. Final Design Plan: Tactical urbanism” on page 44.
Design Concept

Patterns developed to reflect Mahatma Gandhi's principles with easy-to-apply templates can be used along reclaimed spaces to clearly demarcate the vehicular spaces from the ones for pedestrians.

Crosswalks and reclaimed spaces at the junction will be highlighted in bright colours with cones or tyres, delineating the at-grade pedestrian space.

While the conceptual design imagined a colour scheme reflecting the surrounding green and blue from the river Yamuna flowing nearby, the final implemented design adopted a wider range of colours to add vibrancy to the surroundings.
4. DETAILED DESIGN
4. 1. Detail Design: Tactical Urbanism Trial

Final Plan

The map on the right showcases the detail Tactical Urbanism design developed iteratively through multiple stakeholder consultations.
Site Layout Plan

Figure 43. Final execution plan
The Tactical Urbanism detailed design report with all drawings and cost estimates required for execution was prepared for the hybrid option and the trial was executed between 9-15 November, 2021.

It was inaugurated by the Transport Minister of New Delhi, Shri Kailash Gahlot on 25 November, 2021, who appreciated the road safety measures and the traffic streamlining.

The impact assessment was conducted in two stages:
1. Before the execution on 3 November, 2021
2. After the execution from 27 to 29 November, 2021

Figure 45. Discussions underway during the execution phase
Source: Jana Urban Space

Figure 44. Geometry around the island improved to allow for traffic calming, smooth movement of vehicles, safe refuge areas and reduced crossing distance for pedestrians.
Source: SaveLIFE Foundation

Figure 46. The refuge island expanded to accommodate a reduced crossing distance for pedestrians. Traffic lanes streamlined further to allow for a smooth movement of vehicles.
Source: SaveLIFE Foundation
Figure 47. Tactical Urbanism trials to streamline traffic movements with designated signages to improve road safety as well as increased pedestrian safety

Source: SaveLIFE Foundation
Figure 48. Inauguration of the Intersection Tactical Urbanism project
Source: SaveLIFE Foundation

Figure 49. Inauguration ceremony by Transport Minister of Delhi, Shri Kailash Gahlot
Source: SaveLIFE Foundation

Figure 50. Improved geometry of the median to streamline traffic and allow for safe refuge areas for crossings on an eight-lane road
Source: SaveLIFE Foundation

Figure 51. Aerial view of the Tactical Urbanism trials showing the efficient geometry, reduced crossing distance and improved road safety for all
Source: SaveLIFE Foundation
Figure 52. Reclaimed street space for refuge island to help improve pedestrian safety and reduce the crossing distance on an eight-lane road

Source: SaveLIFE Foundation
Impact Assessment

The impact assessment of the TU trials at the Rajghat Intersection was conducted in November 2021 by an independent external third-party agency. The key findings are listed below:

Vehicular Impact Analysis
Parameters such as maximum clearance speed and conflicts between vehicles have been considered to analyse the impact of interventions on vehicular users.

A. Maximum Clearance Speed
The fastest of clearance speeds that each type of vehicle has moved within the Intersection (in green time) has been calculated. It is observed that there is a reduction of 10% in maximum clearance speed during peak hours and a reduction of 2% during non-peak hours, during the TU trial scenario.

B. Vehicle to Vehicle Conflict
The counts of conflicts between a reference vehicle with the target vehicle has been calculated at the Intersection for both before and during the TU intervention scenarios. It was observed that for peak hours, there was a reduction of 85% in vehicle-to-vehicle conflicts. However, an overall reduction of 81% was observed in vehicle-to-vehicle conflicts at the Intersection.

Pedestrian Impact Analysis
Parameters such as pedestrian exposure distance, exposure time, public realm and the conflicts between pedestrians and vehicles were considered to analyse the impact of the TU interventions on pedestrian users.

A. Pedestrian Exposure Distance
It captures the pedestrian exposure distance with respect to on-going traffic in a business as usual (BAU) scenario i.e., when there is no intervention to improve pedestrian safety. The second scenario captures the probable distance that pedestrians would be exposed to after the intervention. The analysis suggests that, the intervention design reduces pedestrian distance exposed on the road by 47% i.e. 170 m to 90 m.

B. Pedestrian Exposure Time
On similar lines, pedestrian exposure time is calculated by assuming the pedestrian walking speed or on the basis of observations captured at the site. The analysis suggests that the intervention reduces pedestrian exposure time by 30% i.e. from 2 minutes 6 seconds to 1 minute 28 seconds.

Pedestrian Realm
The existing public realm is limited and discontinuous across the Intersection. Thus, to provide continuity, the proposed design proposes a continuous public realm connecting all arms of the Rajghat Intersection. The proposed design has led to an increase of 25% of public realm area.

Pedestrian vs Vehicle Conflict
It was observed that the overall conflicts between pedestrians and various modes of transport reduced by 32%. Further, in terms of mode-wise conflicts, there was a reduction of 38% in conflicts with four-wheelers and 33% with two-wheelers.
Final Constructive Plan

Based on the impact analysis, the final execution drawings have been prepared to be executed at the Intersection.

Key features are highlighted in the plan on this page and enlisted below:

1. The free left on the Rajghat side has been converted into a pedestrian-priority slow moving traffic lane. (Demarcated through a different pavement material).
2. All other free lefts have been streamlined with two uniform travel lanes.
3. Pedestrian crossing distances have been reduced and the footpath area has been increased to improve pedestrian movement and road safety.
4. The overall pedestrian crossing distances throughout the Intersection have been reduced by 30%.
5. Refuge islands have been designed with widened width and improved public space to provide safe waiting area for pedestrians.
6. The medians have been designed with at grade refuge areas for pedestrians to cross the Intersection.
7. Medians have been widened to allow for uniform traffic lanes.
8. Merging lanes and efficient traffic movement has been taken care of by geometric improvements at the Intersection.
9. Access/service lane has been closed at the Intersection to prevent additional traffic from entering the Intersection and causing conflict points.

The tentative estimated cost for the final design is Rs 1.47 crore.