

# Redevelopment of Staggered Intersection at Seven Hills Square, Aurangabad

Varsha Ahuja<sup>1</sup>, Sumedh Mhaske<sup>2</sup>

<sup>1</sup>Student, Dept. of Civil Engineering, VJTI College, Mumbai-400-019

<sup>2</sup>Assistant professor, Dept. of Civil Engineering, VJTI College, Mumbai-400-019

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**Abstract** - The study aims at redevelopment of major conflict points on urban road network i.e. intersections. It also includes enhancing the workability of conventional intersections by redeveloping it as contemporary intersections depending on traffic volume for a desired location. The methodology includes site selection, collection and evaluation of the data accurately as to reduce the heavy left hand traffic. Thereby, the determination of design components to reduce traffic congestion and pedestrian safety is considered as the equitable objective of the research. The factors such as the land required for redevelopment, the activities involved and the costing are to be determined so as to derive the best alternative possible for an economical construction of at-grade junctions. To increase the travelling speed of vehicles at intersections thereby maintaining the environmental pollution under prescribed limits, the specifications under the Indian Road Congress manual SP 41 are considered. This study provides recommendations to traffic engineers on the conditions under which intersections perform better and thus, should be considered as design alternatives depending upon the time and cost measures.

**Key Words:** Roundabout intersection, continuous flow intersection (CFI), average queue length, turning restrictions design problems (TRDP).

## 1. INTRODUCTION

Stimulating economic growth and development of road infrastructure in regions falling behind in economic growth is the objective of many countries. It is an inverted U-shaped dependency relationship between civilization and economic growth. The road network in India is responsible for the transportation of commercial goods so as to meet the increasing demand of the growing population. Due to this the historical development of road infrastructure indicated that countries that are more efficient generally have better road networks, thus promoting agriculture, trading industries and accounts sector. The Intersections or at grade junctions are defined as the "planned points of conflict in any roadway system". The intersection represents a matrix situation for number of lane pavements intersecting to navigate the continuous traffic flow thereby reducing the travel time. With the increasing population the amount of vehicular traffic volume increases thereby leading to significant swell of axle load conditions on intersections. In order to reduce the traffic volume the need for conversion of conventional intersections to designed intersections has risen.

## 1.1 SCOPE OF STUDY

The scope of the study aims at the drafting of the suitable junction type for a stimulated road network. Also, determination of the different design components as per the **Indian Road Congress SP 41-1994** to accumulate fewer spot delays and number of stops so as to reduce the waiting time period for the traffic flow. The adopted intersection design should be responsible for providing vehicular and pedestrian safety which is the linguistic objective of any intersection reducing travel time and the redevelopment costs.

## 1.2 METHODOLOGY

- I. Preliminary survey- This stage involves the study and analysis of previous research done regarding the design and development of intersections, the cost effective measures applied and the on-site applications along with finding out the desired study area and defining desired goals and objectives.
- II. Data collection-The data collection involves collection of various kind of information to form the basis of the task to be done, the conflicts data, traffic flow data, various road maps showing intersections.
- III. Analysis of data- Analysing the data collected and finding out effective solution in terms of redesign, also finding out components.
- IV. Designing the alternative options and selection of any one type of intersection amongst the alternatives.
- V. Finding out the execution activities and the costs involved.

## 2. SITE SELECTION

Aurangabad is an ancient city and a major city in the Indian state of Maharashtra. It is considered to be the historical and industrial site of Maharashtra located on the banks of the Kham River. The study area is located in the North Central province and is bound by 19 ° 53'0 "N Latitude and 75 ° 20'00" at Longitude and a total land area of 135.752 Km. The city has 52 historic gates, but only 13 survive at some point.

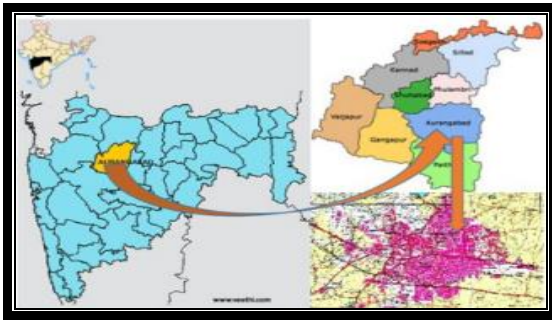


Fig 1: Geographical Image –Aurangabad

Many developing cities have a lot of traffic problems with increasing traffic, with the intersection of Seven Hill Square, part of Aurangabad city, located in the Marathwada district of Maharashtra, the road problem is caused by long waits and unruly traffic. The seven-hill flyover, built about a decade ago to reduce traffic on the busy Jalna Road, is considered a part of city life and separates the city into old and new.

As in past few decades, city has undergone rapid growth, increasing traffic day by day, it is impossible to control by traffic police manually, although signals are provided, the traffic congestion is not reduced effectively. In order to reduce the traffic congestion as well as to improve the aesthetic view at the said intersection, we suggest designing an unconventional type of intersection keeping in view the need of minimizing stopping points and the conditions favoring continuous flow and rotary intersections.

At the intersection there are four roads,

Namely-

1. Gajanan Maharaj Mandir Road (Garkheda parisar)
2. Central Naka Road (MGM Hospital Road)
3. Aurangabad - Jalna Highway (NHA-753 A) towards old city
4. Aurangabad - Jalna Highway (NHA-753 A) towards airport

The first two are major district roads with 9m carriage way and the Aurangabad Jalna road is a National Highway with 12m lane width.

The roads are controlled with traffic signals of 120 sec allowance during peak hours.

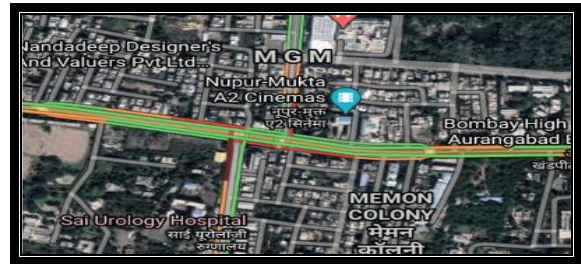


Fig-2: Seven Hills Square Aurangabad

## 2.1 DATA COLLECTION AND ANALYSIS

To gather information, we did research in the morning, afternoon and evening, on a few days a week, namely Monday, Wednesday, Friday, Saturday, and Sunday, so that we could cover cars on weekdays and weekends. The data says traffic volume is high on Friday i.e., survey 3 in the morning; we suggest that it may be advisable to process this data for road reconstruction details.

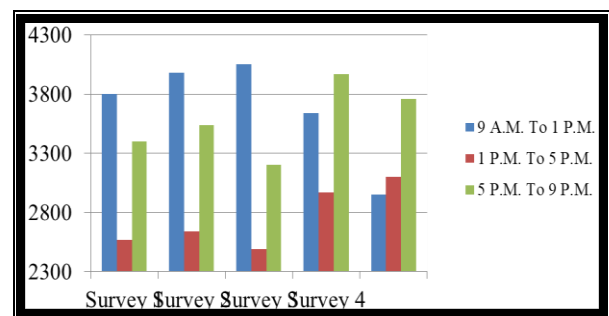


Chart-1 : Survey Graph –Seven Hill, Aurangabad

The above data states that traffic volume is high on Friday i.e., the 3rd survey in the early hours of the morning, considering that it would be advisable to process this data for the purpose of road reconstruction.

Table -1: Data collected in peak hour

Approach	Left Turning			Straight Heading			Right Turning		
	Two Wheeler	Car/ Auto	Bus/ Other	Two Wheeler	Car/ Auto	Bus/ Other	Two Wheeler	Car/ Auto	Bus/ Other
N(Leg A)	86	66	12	123	164	16	114	168	11
S(Leg B)	238	250	17	247	82	23	165	162	12
E(Leg C)	106	205	25	296	125	32	109	89	8
W(Leg D)	137	115	12	194	115	42	202	104	21

The above data states that traffic volume is high on Friday i.e., the 3rd survey in the early hours of the morning, considering that it would be advisable to process this data for the purpose of road reconstruction.

Research data 3 collected in the morning (9 AM to 1 PM) is displayed.

Conflicts occur in the organization due to excessive intrusion into the intersection, traffic entering through routes facing violations of traffic signals and traffic laws.

Many ways with one leg are shown in the figure below

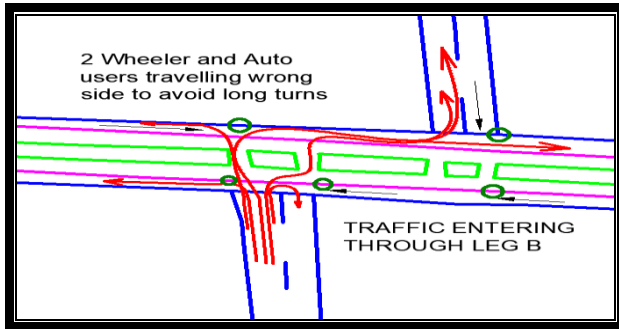


Fig 3: Conflict points at the Intersection

From the data collected, it is evident that the volume of traffic varies from day to day, the highest volume of traffic is between the peak hours of the morning from 9am to 1pm, and rises to 3800 PCU per hour.

Depending on the current traffic conditions, future demand may be met.

Street state and locations are identified by Google Earth.

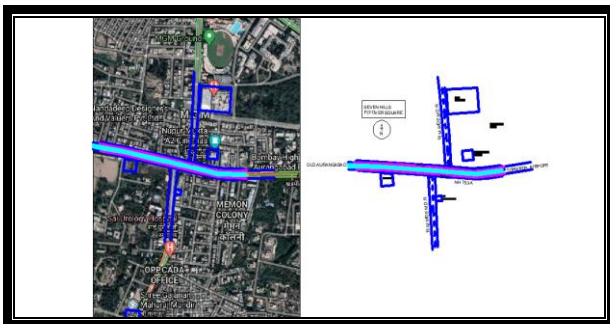


Fig 4- Google maps- location tracing

1. Central Naka Road (MGM Hospital Road) – Leg A
2. Gajanan Maharaj Mandir Road (Garkheda parisar)- Leg B
3. Airport to old Aurangabad (NHA-753 A) –Leg C
4. City to Airport and MIDC Area –Leg D

## 2.2 REALIGNMENT

Here's to providing a safe, efficient, and cost-effective way to deal with conflicting needs or concerns. This study aims to explain some of the principles of good road construction. Demonstrate a professional trade that the designer must face in a variety of situations, including construction costs, maintenance requirements, close land use compliance,

operational and safety impacts, environmental sensitivity and compliance with infrastructure requirements.

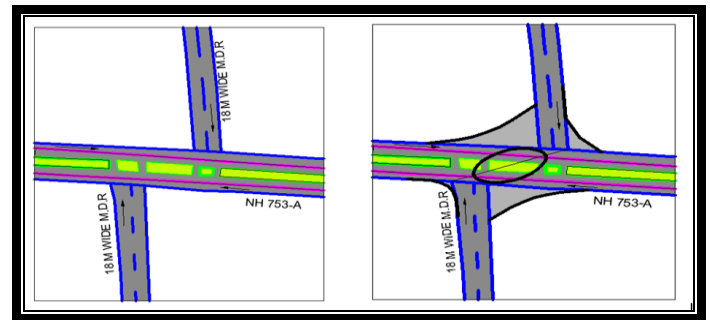


Fig 5- Intersection realignment

## 2.3 GEOMETRIC DESIGN OF ROUNDABOUT

The design components are derived using the formula and guidelines given in IRC 65-

Design speed- 30 KMPH

The shape of the middle island – Oval shaped

Inlet radius (ei) – 20m

Exit radius- 30m

Medium island width -30m

Weaving the length – 30m

Weaving angles -60 degrees

Departure width at exit and exit - 24m

Width phase (e2) -20 m

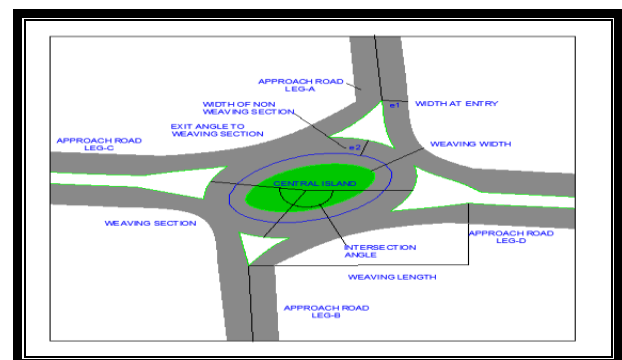


Fig 6- Rotary intersection with components

## 2.4 GEOMETRIC DESIGN OF CFI

### Traffic space design-

#### 1.Design of midblock intersection-

A road crossing within a distance of L-meter from a major intersection is required to be provided for the intersection of left-hand traffic and continuous flow. The distance between the intersections between the intersections and the main cross should be matched to the integration control plan. Control effects will be worse as the distance becomes longer. The L value is determined by the distance between the ascending and descending intersections, the maximum line length and the average speed.

#### 2. Design of main intersection-

Includes route width and number of routes and enhanced route design The route width is determined by location, road condition and traffic conditions. The number of routes is determined by the hourly design volume of the routes and the design capacity of the specific routes. The wide line design is made with a widened width design, extended road construction and augmented length design.

#### 3. Recommendation of parameter values.-

Distance between intersections - usually less than 300m

Long line - about 150m

Average speed in the road section - 30km / hr

Left side line width - 3.50m

Range of right turn line- 3.25m

Straight line - 3.0m

Exit width exit- 3.50m

Price L- 100m

Length of intersection 40m

According to the geometric features of the intersection,

Extended length of right turn line -76m Widened length of right turn lane of exit ramp -92m

Widened length of specialized left turn lane at upstream midblock intersection - 150m

Traffic organization design-

#### Traffic organization of left turn vehicles-

Cars enter the left lanes under the direction of traffic signs and reach the intersection of the central road. If vehicles

receive a red light during a blockade, vehicles must stop. When you get a green light, the cars start to pass. The intersection signal at the intersection is connected to the intersection signal, so that the left-hand lane may receive a green left turn lane while the opposite lane may face a red light.

#### Traffic organization of right turn vehicles-

Right turn vehicles complete turning right along channelized right-turn lanes.

#### Traffic organization of straight vehicles-

Direct cars wait at intersections when they receive a red light. When the light finally turns green, straight cars cross the highway and continue across the intersection. Signs at intersections at intermediate intersections at intersections operate with a single troller and are connected so that vehicles can cross the intersection continuously.

#### Traffic control design-

The CFI traffic control design includes the inclusion of road traffic lights, the design of signal sections and the design of traffic sign communication controls.

1. Transmission of signal lights- Signal lights are located at the intersection of the central street and at intersections.

2. Construction of signal sections- CFI is a 2-phase controlled intersection due to the removal of collision points between vehicles turning left and coming across the intersection. Assuming there are two lanes, road A and road B. The first phase of the signal uses direct traffic on road.

3. Establishment of a road traffic control link-

4. Making cars cross the CFI continuously, one of the most serious problems is controlling the connection of the traffic signal, includes cycle, separation and subtraction. The state of the art of link control or

5. Traffic signals can be divided into two categories - systematic controls based on delays and systematic controls according to the green band.

## 2.5 SELECTION OF INTERSECTION TYPE

Here we list the components of the flow of flow and continuous type, both the best modes of the selected area. The specially designed roadblock is able to handle current and future traffic smoothly. Continuous flow integration is also a good alternative, as it provides continuous flow and reduces space and displays delays reducing volume.

The intersection to be constructed is an existing intersection and the surrounding area is a developed urban center which makes it difficult to create more meeting space. Depending

on the site conditions selecting a simple intersection type to build on the existing intersection is required.

So when considering land that needs to change intersections to increase traffic volume and smoothness, traffic congestion is a good solution to apply to a selected area.

Here the road designed for rotation has a capacity of 4100 PCU / hr and the maximum for the required capacity is 3600 PCU / hr. We can therefore conclude that a structured cycle can effectively control the current flow of traffic, and in the near future a small increase in traffic flow can also be effectively controlled. If the roundabout is provided traffic congestion will be reduced and half the traffic at intersections will be reduced.

### 2.6 COST ANALYSIS

The cost analysis is done by finding out the quantities for the flexible pavement for the designed geometric components and the specifications and rates are taken from the SSR-2021 for the Maharashtra state.

Table -2: Measurement sheet

Detailed Estimate for flexible pavement on existing intersection						
LENGTH, WIDTH AND THICKNESS VARIES AS PER THE LEG OF INTERSECTION						
SERVICE LIFE - 30 YEARS						
MAINTENANCE AFTER EVERY 9 YRS						
Sr No	Particulars of items of works	No.	Length H (m)	Breadth H (m)	Ht or Depth (cm)	Quantity
<b>PRE-EXECUTION</b>						
1	Surveying and dogholing etc.	1	1997	-	-	1997 sqm
2	Land acquisition on permanent basis	LEG-A	1	1117	-	1117 sqm
		LEG-B	-	-	-	-
		LEG-C	1	880	-	880 sqm
		LEG-D	-	-	-	-
3	Land acquisition on temporary basis	LEG-A	-	-	-	-
		LEG-B	-	-	-	-
		LEG-C	-	-	-	-
		LEG-D	-	-	-	-
4	Earthwork in embankment	1	1117	-	-	1117sqm
5	Plantation of grasses on the side slope	1	222	-	-	222 m
<b>METALLING</b>						
6	Preparation of sub-grade (dressing to camber)	1	608 m	4.00m	-	2432 sq.m
7	Soiling coat					
	i) Stone ballast 15 cm size	1	608 m	4.00 m	0.15 m	364.8 cum
	ii) Laying and consolidation of ballast including blinding with local sandy soil		Same as above			364.8 cum
8	Inter coat					
	i) Stone ballast 50 mm gauge	1	608 m	3.70 m	0.12 m	270 cum
	ii) Laying and consolidation of ballast including blinding with local sandy soil		Same as above			270 cum
9	Top coat					
	i) Stone ballast 40 mm gauge	1	608 m	3.70 m	0.12 m	270 cum
	ii) Laying and consolidation of stone ballast including blinding with local sandy soil		Same as above			270 cum
10	Beam or patri dressing	1	222 m	-	-	222m
<b>PAINTING OR BLACK TOP SURFACING</b>						
<b>Painting 1st coat with Road Tar No.3</b>						
	i) Stone grit 20mm gauge @1.35 cu.m. % sq.m.	1	608 m	X 3.70 m	X 1.35/100	30.3696 cum
	ii) Paint or binding Road Tar No.3 @230kg % sq.m.	1	608 m	X 3.70 m	X 220/100	4969.12 kg= 4.5 tonne
	iii) Laying	1	608 m	X 3.70m	-	2249.6 sq.m.
<b>Painting 2nd coat with Asphalt</b>						
	i) Stone grit 20mm gauge @0.75 cu.m. % sq.m.	1	608 m	X 3.70 m	X 0.75/100	16.872 cum
	ii) Paint or binding Road Tar No.3 @120 kg % sq.m.	1	608 m	X 3.70 m	X 120/100	2699.52 kg = 2.7 tonne
	iii) Laying	1	608 m	X 3.70 m	-	2249.6 sq.m.
13	Brick edging on both sides- including bricks and labour	1	608 m	-	-	608 m
14	Road markings and signs	1	608 m	-	-	608 m
15	Formation level pillars	1	608 m	-	-	608 m
16	Traffic diversion, service road etc.	1	608 m	-	-	608 m
17	Arboculture	1	608 m	-	-	608 m

Table -3: Abstract sheet-1

Item No.	Particulars of items of work	Quantity	Unit	Rs.	Rate P.	Per	Amount P.
<b>PRE-EXECUTION</b>							
1	Surveying and dogholing etc.	1997	sqm	115.00		sqm	229655.00
2	Land acquisition on permanent basis	LEG-A	1117	sqm	5500.00	sqm	6143500.00
		LEG-B	-	-	-	-	-
		LEG-C	880	sqm	4300.00	sqm	3784000.00
		LEG-D	-	-	-	-	-
3	Land acquisition on temporary basis	LEG-A	-	-	-	-	-
		LEG-B	-	-	-	-	-
		LEG-C	-	-	-	-	-
		LEG-D	-	-	-	-	-
4	Earthwork in embankment	1117	sqm	325.00		sqm	363025.00
5	Plantation of grasses on the side slope	222	Mtr.	25.00		Mtr	5550.00
6	Fixing change Stone / Bench mark Stone / Center Stone / Apex Stone in earth and all sorts of soil and soft murum including conveying excavated material, fixing stone, including painting lettering numbers and back filling etc. complete.	35	nos.	169.00		Nos.	5915.00
7	Taking the trial pit for roads, alignment, C.D. Works in earth soil of all sorts, sand gravel or soft murum, including stacking the excavated material including all lifts and necessary back filling upto depth 1.5 meters.	364	cum	425.00		cum	154700.00
8	Fixing survey pegs in earth and all sorts Soil, Sand, Gravel, Soft Murum, etc. including conveying, fixing etc. complete.	50	nos.	10.00		Nos.	500.00
9	Reconnaissance Survey of Road alignment in plain country including taking three dimensions of apex, verification of type of land etc. along with the alignment etc. complete (With Chaining).	0.608	km	4746.00		km	2885.57
10	Detailed survey of road in plain country including chaining and levelling with cross sections at every two chains inclusive of cleanness of survey each day.	0.608	km	5983.00		km	3637.66
11	Providing and Fixing Wooden survey pegs including White washing etc. complete.	50	nos.	45.00		Nos.	2250.00
12	Cutting down branches of trees / bushes etc. stacking the material neatly as directed (For Motorable Road)	0.608	km	7399.00		km	4498.59
13	Preparation of detailed Plans and Estimates of road including typing in 5 copies, ammonia prints, with colouring of plans, proper filling, indexing and paging etc. complete and all types of compliance, if required from Department.	0.608	km	15029.00		4	9137.63
14	Determination of right of way (ROW) as per design using total station including calculation of co-ordinates of 30 Meter interval on both sides of road.	0.608	km	9421.00		km	5727.97

Table -4: Abstract sheet-2

15	Preparation of Land Acquisition proposal including collection of 7/12 and R.A. documents marking alignment on village maps, area calculation, preparation of proposal, printing, binding, etc. complete and submission of 5 sets more or less as per the format with requisite with compliance if any until finalisation of award including Joint measurement of the alignment. For existing alignment.	0.608	km	17201.00		km	10458.21
16	Determination of Road boundary (ROW) including fixing the boundary stones of standard size and shape including fixing in block of standard size of C.C. of 1:4:8 white washing at 30 M interval on both sides.	8	km	38856.00		km	310848.00
17	Providing detailed geological reports of proposed site by maintaining geotechnical investigation of structure classification, collecting soil, rock and ground water samples for laboratory tests to arrive the foundation design parameters, Rock experience such as open rock, jointing fractures, etc. complete with suggestion about the site foundation and remedial.	1	Report	38720.00		Nos.	38720.00
18	Geometrical design of road horizontal and vertical curves for design speed specified by IRC including carrying out trial for optimum of civil cost minimizing land acquisition and maximum use of existing facility and preparation of widening arrangement drawing for existing structures stake out date for horizontal alignment and working levels including super elevation effect etc. complete.	0.608	km	17717.00		km	10771.94
19	Triangulation and taking out design coordinates of baseline on ground using nails for existing road surfaces and survey pegs for new alignments including taking out coordinates for horizontal curves at required interval of 50 meters etc. complete. (Extra line such as right of way median edges to toe line not included)	0.608	km	12218.00		km	7428.54
20	Design of junctions including detail layout of traffic signs, infomatory boards traffic islands. Breaks in median verge including working levels at junctions as per IRC. Major Junction	2	nos.	28166.00		Nos.	56332.00
21	Providing of deep vehicle for conveying survey material, Engineers, labourers, etc. complete	45	day	3630.00		day	163350.00
22	Cutting down trees including trunks and branches with girths above 30cm to 60cm and stacking the materials neatly with all lifts and load of 1000kg as directed and earth filling in the depression / pit if any.	25	nos.	462.00		Nos.	11550.00
23	Leaving grass and removal of rubbish up to a distance of 50 metres outside the periphery of the area.	2600	sqm	4.00		sqm	10400.00
24	Excavation for roadway in earth, soil of all sorts, sand, gravel or soft murum including dressing sections to the required grade, camber and side slopes and conveying the excavated materials with all lifts upto a load of 50m, and spreading for embankment or stacking as directed. By Manual Means. (with prior permission of S.E.)	10125	cum	272.00		cum	2754000.00

Table -5: Abstract sheet-3

25	Watering and compacting of embankment formed of materials obtained from the road cutting within a lead of 50 m, not less than 97 % of standard Proctor density after laying them in layers of 20 cm, to 30 cm, with vibratory roller.	10125	cum	73.00		cum	739125.00
26	Supplying hard murum / kankar at the road site, including conveying and stacking complete.	10125	cum	321.00		cum	3250125.00
27	Supplying soft murum at the road site, including conveying and stacking complete.	10125	cum	318.00		cum	3219750.00
28	Spreading hard murum / soft murum / gravel or kankar for side width complete.	10125	cum	72.00		cum	729000.00
29	Compacting the hard murum side widths including laying in layers on each side with vibratory roller including artificial watering etc. complete.	1000	sqm	16.00		sqm	16000.00
30	Providing, laying and spreading soil on a prepared sub-grade, pulverizing, mixing the spread soil in place with rotavator with 3 per cent slaked lime with minimum content of 70 per cent of CaO, grading with motor grader and compacting with the road roller at OMC to achieve atleast 98 per cent of the max dry density to form a layer of sub base.	10125	cum	532.00		cum	5386500.00
31	Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader / Paver on prepared surface and compacting with vibratory roller to achieve the desired density, complete as per clause 401- Plant Mix Method and Grading - III Material	10125	cum	1738.00		cum	17597250.00
32	Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately etc. complete	10125	cum	375.00		cum	3796875.00
33	Providing, laying, spreading and compacting stone aggregates of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing to proper grade and camber, applying and brooming requisite type of screening / binding Materials to fill up the interstices of coarse aggregate, watering and compacting with Vibratory roller, to the required density. By Mechanical Means - Grading I (Using Screening Type A (13.2) mm Aggregate	10125	cum	1876.00		cum	18994500.00
34	Dismantling of existing B.T. Surface (flexible Pavement) to a depth of 50 mm, manually including loading of dismantled material to transport vehicle at site excluding load charges		sqm	25.00		sqm	0.00

Table -6: Abstract sheet-4

35	Providing and constructing 50 mm. thick Modified Penetration Macadam (MPM) road surface including all materials, preparing the existing road surface, spreading 40mm. stone metal layers 30% crusher broken metal + 70% Hand broken (by breaking rubble obtained by blasting) heating and spraying the bitumen of specified grade @ 1.75 kg/sqm, spreading 12mm.size chips compacting with static roller having weight 8 to 10 MT. to achieve the desired degree of compaction as per Technical Specification Clause 506 etc. complete. Including picking of existing WBM surface (VG-30 bulk bitumen rates are considered to arrive at rates	4500	sqm	136.00	sqm	612000.00
36	Surface Dressing -- Providing and laying surface dressing as wearing course in single coat using crushed stone aggregates of specified size on a layer of bituminous binder laid on prepared surface and rolling with 8-10 tonne smooth wheeled steel roller. -- a) 19 mm nominal chipping size (bitumen 12.00 kg/10 Sq.M.) -- Bitumen of specified grade (VG-30 bulk bitumen rates are considered to arrive at rates)	4500	sqm	61.00	sqm	274500.00
37	9 MM SEAL COAT: Providing and laying of Type A 9mm premix seal coat with HMP of appropriate capacity crushed stone chipping 6.7 mm size and penetration bitumen of specified grade @ 1.2kg/Sq.m, preparing existing road surface by mechanical means, spreading chips and rolling, by static roller having weight 8 to 10 MT. etc. complete (VG-30 bulk bitumen rates are considered to arrive at rates	4500	sqm	65.00	sqm	292500.00
38	Lettering for informatory sign boards etc. complete.	12	nos.	236.00	Nos.	2832.00
39	Lettering on masonry works with nafla flow direction, span number and location etc. complete.	24	nos.	27.00	Nos.	648.00
40	Painting letters upto 20 cm height complete brushes, coat brushes, dusting, cleaning, including cost of paint etc. complete.	42	nos.	27.00	Nos.	1134.00
41	Providing and fixing reflective fluorescent tape on old road sign board by following the procedure recommended by manufacturer. Tape shall be consist of white or coloured sheeting having smooth outer surface which has the property of retro-reflection over its entire surface. It shall be weather resistant and show colour fastness. It shall be new and unused and shall show no evidence of cracking,scaling,pitting,blasting,edge lifting and shall have negligible shrinkage or expansion including cleaning / scraping and painting of existing board etc. complete. (Guidance on the recommended application of each class of tape may be taken from IRC-67)	4500	sqm	6037.00	sqm	27166500.00
42	Footpaths and Separators -- Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar 1:3 including provision of all drainage arrangements but excluding kerb channel.	222	sqm	836.00	sqm	185592.00

which is least prioritized in DP plan; here the redevelopment of the Seven Hills Square needs to be addressed.

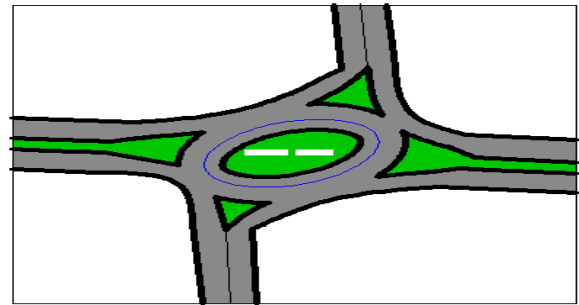


Fig 7- Rotary intersection

The study shows that Rotary intersection is a good alternative amongst many unconventional types, for the selected location. The redevelopment requires the acquisition of land along the existing intersection, to achieve the standard size of components of a rotary.

Table -7: Abstract sheet-5

43	Labour for filling pot holes with premix asphalt chips, cleaning the road surface with wire brushes and gunny bags, applying tack coat, spreading mixture hand ramming or light compaction with power roller conveying material to the site of work (excluding cost and of material fuel and heating asphalt) etc complete.	2100	sqm	66.00	sqm	138600.00
<b>PAINTING OR BLACK TOP SURFACING</b>						
<b>Painting 1st coat with Road Tar No.3</b>						
	i) Stone grit 20mm gauge @1.35 cu.m. % sq.m.	30.3696	cum	1500.00	cum	45554.40
	ii) Paint or binding Road Tar No.3 @230kg % sq.m.	4.5	tonne	2500.00	tonne	11250.00
	iii) Laying	2249.6	sqm	600.00	sqm	1349760.00
<b>Painting 2nd coat with Asphalt</b>						
	i) Stone grit 20mm gauge @0.75 cu.m. % sq.m.	16.872	cum	1200.00	cum	20246.40
	ii) Paint or binding Road Tar No.3 @120 kg % sq.m.	2.7	tonne	2200.00	tonne	5940.00
	iii) Laying	2249.6	sqm	450.00	sqm	1012320.00
45	Brick edging on both sides- including bricks and labour	0.608	km	950.00	km	577.60
46	Formation level pillars	-	-	-	-	-
47	Traffic diversion, sevice road etc.	0.608	km	-	-	-
48	Arboriculture	0.608	km	-	-	-
Sub Total						98937920.51
Add 3% for Contingencies						296813.7615
Add 2% for Working Establishment						197875.841
Total						99432610.11
Estimated Cost Comes to Rs. 99432610.00						Say Rs. 99432610.00

4. CONCLUSIONS

In this study a complete redevelopment plan for Seven Hills Square is discussed, including geometric design, design components, activities involved, specification of each activity and costs. The study gives the tentative amount which will be required to execute the redevelopment, using cost effective measures avoiding delays in construction time.

The study gives an alternative with minimum stop delays, queue length and avoiding the waiting time at signal.

The safety of the traffic volume at approaching lanes is ensured

The rotary type is the economical intersection design type amongst the alternatives.

The travelling speed of vehicles at intersections is increased thereby maintaining the environmental pollution under prescribed limits and indirectly supporting in development of roadway network.

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3. RESULTS

The project cost for the intersection redevelopment for length 608m at the selected location is rupees 994,32610.00 i.e. Nine crore ninety four lakhs thirty two thousands six hundred and ten only. The rates are taken from the SSR 2021 for the Maharashtra state As per the present situation at the selected location the intersection is under major conflict points, as the arterial roads are passing through the National Highway under a flyover, the staggered shape of present intersection is leading to many wrong side turns and traffic entering through opposite sides.

In the current development plan of the Aurangabad city, many modifications are suggested for major highways. Intersections are also a major part of an urban road network

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