

**“ROTARY INTERSECTION DESIGN AT SANJAULI CHOWK”  
(H.P.)**

**A PROJECT**

*Submitted in partial fulfillment of the requirements for the project presentation  
of*

**BACHELOR OF TECHNOLOGY**

**IN**

**CIVIL ENGINEERING**

Under the supervision of

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## **CERTIFICATE**

This is to certify that the work which is being presented in the project report titled “ROTARY INTERSECTION DESIGN AT SANJAULI CHOWK” in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering and submitted to the Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by Prajul Bekta (131310), Siddharth Sharma (131320), Himanshu Sharma (131654) during a period from July 2016 to June 2017 under the supervision of Mr. Abhilash Shukla, Assistant Professor, Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat.

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## **ABSTRACT**

In the past few years a tremendous increase in traffic has been observed everywhere. The increasing growth of vehicles has caused heavy traffic congestions on the roads and intersections, which are even worse during the traffic peak time. An intersection which is not well designed, will not only increase the travel time of the vehicles but also cause more traffic accidents. It is therefore necessary to make the design of the intersections properly. The basic principles considered for the design includes the principles of uniformity & simplicity, minimize conflict points, and alignment of profile. A detailed survey of the study area was conducted and peak hour traffic volume was estimated through traffic volume survey. An Origin and destination survey was also being conducted and people were interviewed and the data was recorded.

In order to improve the traffic conditions at the Sanjauli Chowk (H.P.) and also to reduce the accidents at the crossing, we suggest designing the rotary at the said intersection keeping in view high traffic and conditions favouring the rotary. For this traffic volume studies and origin and destination survey is done and the design is done accordingly.

# CHAPTER 1: INTRODUCTION

## 1.1 Overview

Rotary intersections are the form of intersections that are being laid out for the movement of traffic in one direction around a central traffic island. Essentially all the major conflicts at an intersection are converted into milder conflicts namely merging and diverging. The vehicles entering the rotary are then forced to move in a clockwise direction. They then weave out of the rotary to the desired direction. Good intersection design results from a minimization of the magnitude and characteristics of the conflicts and a simplification of driver route selection process.

## 1.2 Classification of Intersections

Intersections are classified as follows

- (i) At Grade Intersection
- (ii) Grade Separated Intersection.

### 1.2.1 Intersection at-grade

These include all roads which meet at the same level. The traffic movements such as merging, diverging and crossing are involved in the intersections at grade. The intersections at grade are further classified into two categories:

1. **Channelized intersections:** It is achieved by introducing islands into the intersection area in order to channelize the traffic flow into appropriate streams. Channelizing islands 'channelize' the turning traffic into appropriate paths, control the angle of approach of vehicles coming from different legs, reduce the relative speed and decrease the conflict area at the intersections.

- 2. Un-channelized intersections:** In this, the entire intersection area is paved and there are no restrictions to the vehicles to use any part of intersection area. Suitable for very low traffic volume. They are easiest to construct in the field, but most complex in traffic operations resulting in large conflict area and more number of accidents, unless controlled by traffic signals or police.

### **1.2.2 Grade Separated Intersection**

It is a bridge that eliminates crossing conflicts at intersections by vertical separation of roadways in space. Grade separated intersection are also called as Interchanges. Grade separated intersections cause less hazard and delay than grade intersections. Route transfer at grade separations is accommodated by interchange facilities consisting of ramps. Interchanges are described by the patterns of the various turning roadways or ramps. The interchange configurations are designed in such a way to accommodate economically the traffic requirements of flow, operation on the crossing facilities, physical requirements of the topography, adjoining land use, type of controls, right-of-way and direction of movements.

The ultimate objective of grade separated intersections is to eliminate all grade crossing conflicts and to accommodate other intersecting manoeuvres by merging, diverging and weaving at low relative speed.

### **1.2.3 Classification of Grade Separated Intersection**

One of the distinctions made in type of interchange is between the directional and the non-directional interchange. Directional interchanges are those having ramps that tend to follow the natural direction of movement. Non directional interchanges require a change in the natural path of traffic flow.

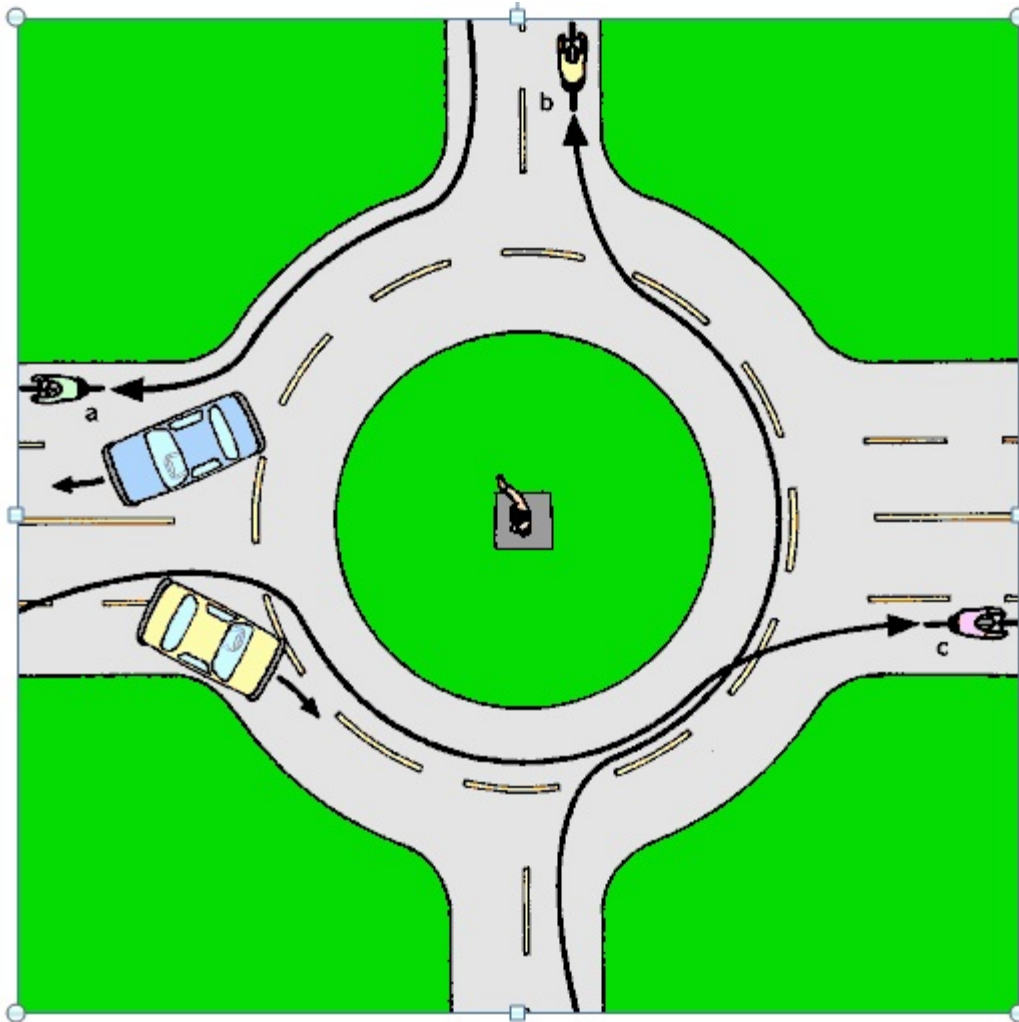
1. Underpass
2. Overpass
3. Trumpet Interchange
4. Diamond Interchange
5. Cloverleaf Interchange
6. Partial Cloverleaf Interchange
7. Directional Interchange

## 8. Bridged Rotary

# CHAPTER 2: Rotary Intersection

A rotary intersection is an enlarged road intersection where all the vehicles that are converging have to move around a central island in a particular direction before they can weave out of traffic flow into their respective directions radiating from the central island.





**Fig1. Traffic manoeuvres in a rotary**

## **2.1 Advantages of Rotary Intersection**

1. In a rotary intersection flow of traffic is regulated to only one direction of movement, hence eliminating severe conflicts between crossing movements.

2. All the vehicles entering the rotary are gently forced to reduce the speed and continue to move at slower speed. Thus, none of the vehicles need to be stopped, which is the case in a signalized intersection.
3. As speed of negotiation is lower and due to elimination of severe conflicts, accidents and their severity are much less in rotaries.
4. Rotaries are self-governing and usually these rotaries do not need practically any control by police or traffic signals.
5. They are ideally suited for moderate traffic, especially with irregular geometry, or intersections with more than three or four approaches.

## **2.2 Limitations of Rotary Intersection**

1. As all the vehicles are forced to slow down before they negotiate the intersection there is a delay which will be much higher than channelized intersection.
2. The vehicles are forced to reduce their speed even when there is relatively low traffic.
3. Rotaries require large area of relatively flat land making them costly at urban areas.

## **2.3 Guidelines for the selection of rotaries**

1. Rotaries are suitable when the traffic entering from all the four approaches are relatively equal.
2. A total volume of about 3000 vehicles per hour can be considered as the upper limiting case and a volume of 500 vehicles per hour is the lower limit.
3. A rotary is very beneficial when the proportion of the right-turn traffic is very high; typically if it is more than 30 percent.
4. Rotaries are suitable when there are more than four approaches or if there is no separate lanes available for right-turn traffic.

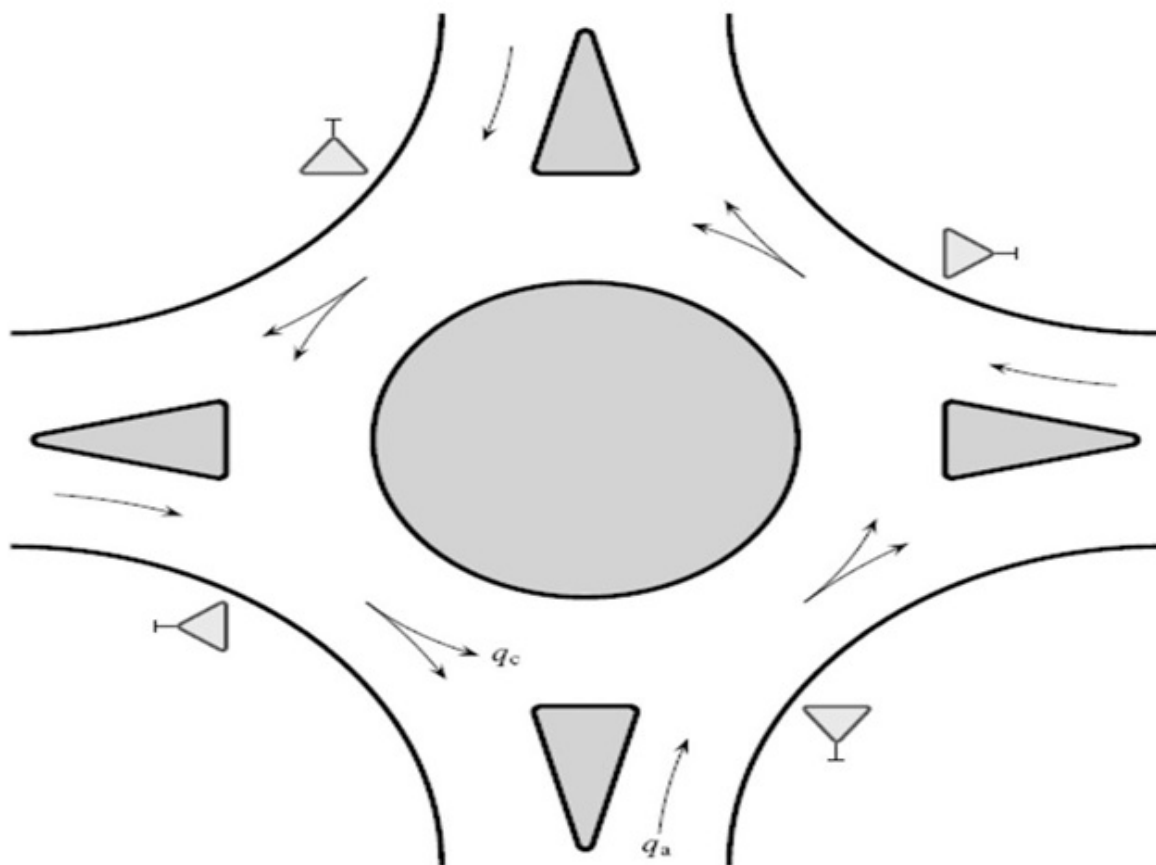
## **2.4 Traffic operations in a rotary**

As noted earlier, the traffic operations at a rotary are three; diverging, merging and weaving. All the other conflicts are converted into these three less severe conflicts.

1. **Diverging:** It is a traffic operation when the vehicles moving in one direction is separated into different streams according to their destinations.

2. **Merging:** Merging is the opposite of diverging. Merging is referred to as the process of joining the traffic coming from different approaches and going to a common destination into a single stream.

3. **Weaving:** Weaving is the combined movement of both merging and diverging movements in the same direction.



**Fig2. Traffic operations in a rotary**

## **CHAPTER 3: LITERATURE REVIEW**

Road intersections are a critical element of road sections .Design of a safe intersection depends on many factors. The major factors can be classified as under:

1. Human Factors.
2. Traffic Considerations.
3. Road and Environmental Conditions.

The human factors include driving habits, driver's ability to make decision. The traffic considerations include design and actual capacities, design hour turning movement, size and operating characteristics of vehicles, vehicle speed, and traffic mix. The road and environmental conditions include character and use of abutting property, sight distance, and conflict area, area of intersection, geometrical features and traffic control devices.

In the design of an intersection, the primary considerations are safety, smooth and efficient flow of traffic. The basic principle of design includes the principles of uniformity & simplicity; minimize conflict points, safety, and alignment & profile. In order to be able to properly design an intersection and give consideration to factors affecting design, index location plan showing the intersection under consideration, base plan of intersection, peak hour design traffic data (Traffic Volume data, number of PCUs per hour), accident data at intersection as per IRC:53-1982.

The entire design methodology is based on the steps from IRC-65:1976. The method of conversion of traffic volume into PCU has been referred from SP-41:1994. The various methods and techniques of surveying in hilly areas will be as per those mentioned in SP-48:1998.

IRC-52:2001 is used for hilly roads for determining the design speed for hilly roads and various design parameters used for hilly roads.

## **CHAPTER 4: NEED FOR ROTARY INTERSECTION**

From site observations, we see that the intersections are uncontrolled intersections. There are no proper pavement markings, physical dividers like medians, channelizing islands, traffic signals and no pedestrian facilities like footpath, cross walk etc. intersections. The vehicles are not parked properly which worsen the situation during peak hours and leads to extreme congestion in the area. There are encroachments by people on the roads at the study area and temporary vendors like tea stalls, on the intersection. Keeping in view these prevailing conditions in the study area it is clear that proper channelizing of traffic is required in this area as all these factors have an adverse impact on road user's behavior which enhances the possibility of accidents. Therefore it becomes important to design a rotary at Sanjauli Chowk to curb these problems.

## **CHAPTER 5: OBJECTIVES**

- a) To carry out traffic volume study.
- b) To carry out Origin and destination Survey.
- c) To design the intersection on the basis of outcomes of traffic volume survey.
- d) To design the rotary intersection using Auto Cad software.
- e) To design the rotary intersection using Revit software

## **CHAPTER 6: SCOPE OF THE PROJECT**

The scope of this project is to design an efficient rotary intersection to deal with the increasing traffic volume and reduce the number of conflicts and accidents at the junction of Sanjauli Chowk .The project aims to determine the capacity of the intersection in terms of traffic volume and design the traffic rotary.

## CHAPTER 7: STUDY AREA

The area of study for this project is Sanjauli Chowk, district Shimla, H.P. There exists a four-way intersection in which one road stretches from Nav Bahr towards Sanjauli, second from Sanjauli Chowk to IGMC, the third towards Lakkar Bazaar and fourth toward Dhalli. The traffic study conducted at the site shows that there exists a large traffic volume at the junction and there is no proper channelized intersection. This creates a problem for different traffic movements and increases the chances of conflicts which may lead to accidents.



**Fig3.Sanjauli Chowk**



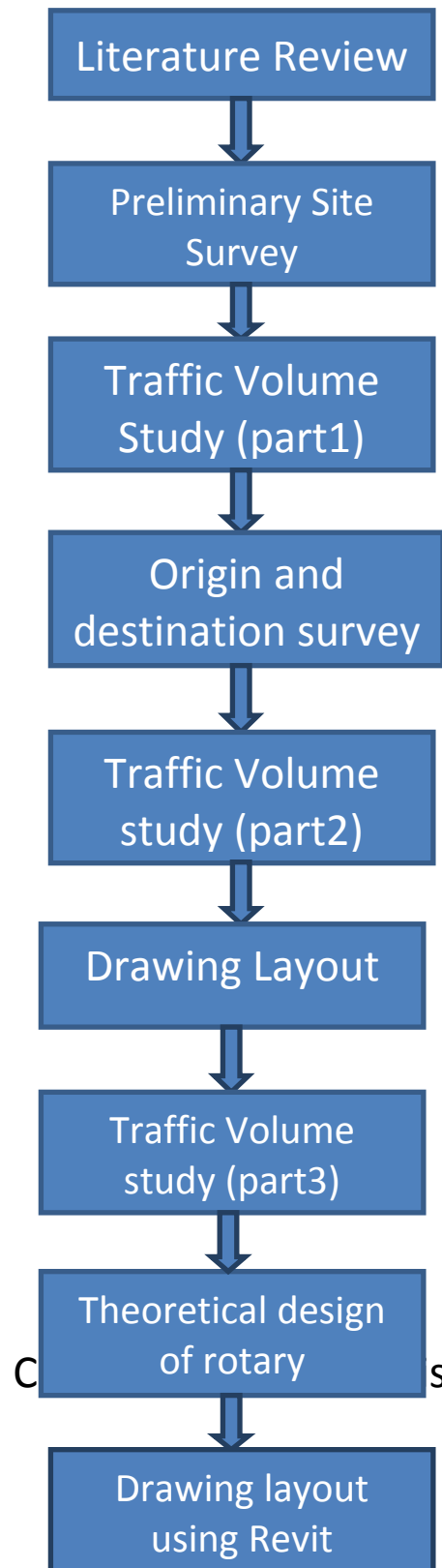


**Fig4. Traffic movement at Sanjauli chowk**



**Fig 5. Sanjauli Chowk**

## CHAPTER 8: FLOWCHART OF PROJECT ACTIVITIES



## CHAPTER 9: TRAFFIC VOLUME STUDY

The traffic survey was conducted in three phases:

Phase 1: Monsoon Season

Phase 2: Winter Season

Phase 3: Summer season

Traffic study was done on week days and weekends. The traffic volume was analysed manually and the average traffic volume was calculated by taking into account the PCU values for different automobiles as suggested by IRC.

SNo.	Vehicle Type	Equivalent Factor
1	Motor Cycle, Scooter or Cycle	0.5
2	Passenger car, Van or Auto-Rickshaw	1.0
3	Agricultural tractor or Light Commercial vehicle	1.5
4	Truck, Bus or Hand cart	3.0
5	Truck trailer or agricultural tractor trailer	4.5
6	Cycle rickshaw	2.0
7	Horse drawn vehicle	4.0
8	Bullock Cart	8.0

Table 1

## Road A

Day 1

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	720	102	529	168	1519
9 to 10am	680	172	580	175	1607
10 to 11 am	631	139	528	126	1424
11 to 12 pm	614	142	496	117	1369
12 to 1 pm	752	127	579	137	1595
1 to 2 pm	695	129	564	121	1509
2 to 3 pm	817	143	498	133	1591
3 to 4 pm	714	115	596	98	1523
4 to 5 pm	655	159	610	133	1557
5 to 6 pm	670	104	514	109	1397
6 to 7 pm	502	78	450	53	1083

Table 2

## Road B

Day 1

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	104	526	298	288	1216
9 to 10am	168	498	321	391	1378
10 to 11 am	129	389	108	498	1124
11 to 12 pm	139	495	119	407	1160
12 to 1 pm	136	434	318	426	1314
1 to 2 pm	128	403	242	401	1174
2 to 3 pm	129	427	302	447	1305
3 to 4 pm	112	351	107	298	868
4 to 5 pm	131	449	165	251	996
5 to 6 pm	56	581	179	209	1025
6 to 7 pm	79	302	101	243	725

Table 3

## Road D

Day 1

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	268	326	165	114	873
9 to 10am	211	398	128	107	844
10 to 11 am	368	289	108	98	863
11 to 12 pm	397	295	119	119	930
12 to 1 pm	392	334	125	101	952
1 to 2 pm	414	403	142	91	1050
2 to 3 pm	453	327	202	117	1099
3 to 4 pm	212	251	107	98	668
4 to 5 pm	291	349	165	151	956
5 to 6 pm	256	381	179	109	925
6 to 7 pm	179	202	101	43	525

Table 4

## Road A

Day 2

Time	A to B	A to C	A to D	A to A	Total(PCU)
9 to 10 am	598	143	408	132	1281
10 to 11 am	691	165	428	162	1446
11 to 12 pm	619	114	456	109	1298
12 to 1 pm	652	128	581	129	1490
1 to 2 pm	795	131	556	112	1594
2 to 3 pm	717	153	477	153	1500
3 to 4 pm	755	117	569	101	1542
4 to 5 pm	685	159	607	117	1568
5 to 6 pm	620	114	551	121	1406
6 to 7 pm	512	89	414	71	1086

Table 5

## Road B

Day 2

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	111	509	291	208	1119
9 to 10am	181	445	312	254	1192
10 to 11 am	121	402	119	406	1048
11 to 12 pm	109	451	129	417	1106
12 to 1 pm	149	466	351	435	1401
1 to 2 pm	133	413	249	421	1216
2 to 3 pm	125	472	319	425	1341
3 to 4 pm	121	363	101	231	816
4 to 5 pm	143	424	159	258	984
5 to 6 pm	96	518	189	227	1030
6 to 7 pm	61	352	99	234	746

Table 6

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	291	341	154	131	917
9 to 10am	212	389	142	111	854
10 to 11 am	290	244	104	106	744
11 to 12 pm	391	226	124	105	846
12 to 1 pm	432	341	139	97	1009
1 to 2 pm	404	391	161	71	1027
2 to 3 pm	435	335	200	128	1098
3 to 4 pm	231	268	115	101	715
4 to 5 pm	295	353	165	148	961
5 to 6 pm	285	399	197	105	986
6 to 7 pm	164	195	84	59	502

Table 7



Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	715	109	554	186	1564
9 to 10am	645	182	568	167	1562
10 to 11 am	609	134	518	116	1377
11 to 12 pm	651	121	465	102	1339
12 to 1 pm	769	125	561	149	1604
1 to 2 pm	702	109	575	132	1518
2 to 3 pm	795	151	465	121	1532
3 to 4 pm	715	124	571	106	1516
4 to 5 pm	649	165	654	124	1592
5 to 6 pm	666	113	498	111	1388
6 to 7 pm	518	99	409	62	1088

Table 8

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	165	505	265	291	1226
9 to 10am	189	480	329	398	1396
10 to 11 am	175	385	100	456	1116
11 to 12 pm	154	499	105	426	1184
12 to 1 pm	129	465	329	433	1356
1 to 2 pm	135	393	236	381	1145
2 to 3 pm	118	445	311	456	1330
3 to 4 pm	116	350	120	281	867
4 to 5 pm	145	423	156	251	975
5 to 6 pm	65	551	185	269	1071
6 to 7 pm	91	345	106	223	765

Table 9

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	254	301	156	119	830
9 to 10am	209	435	136	120	900
10 to 11 am	315	265	114	128	822
11 to 12 pm	399	311	131	102	943
12 to 1 pm	435	325	120	101	981
1 to 2 pm	434	442	161	89	1126
2 to 3 pm	486	305	198	110	1099
3 to 4 pm	201	296	121	91	709
4 to 5 pm	274	365	156	152	947
5 to 6 pm	261	372	189	113	935
6 to 7 pm	198	218	104	39	559

Table 10

Time	A to B	A to C	A to D	A to A	Total(PCU)
8 to 9 am	661	121	565	168	1515
9 to 10am	665	159	601	157	1582
10 to 11 am	633	126	505	161	1425
11 to 12 pm	605	148	479	124	1356
12 to 1 pm	715	125	581	165	1586
1 to 2 pm	681	128	555	112	1476
2 to 3 pm	826	151	468	129	1574
3 to 4 pm	721	119	618	106	1564
4 to 5 pm	665	149	602	145	1561
5 to 6 pm	691	126	496	99	1412
6 to 7 pm	469	65	465	65	1064

Table 11

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	115	496	301	281	1193
9 to 10am	165	511	312	389	1377
10 to 11 am	115	396	131	504	1146
11 to 12 pm	146	465	112	404	1127
12 to 1 pm	151	464	321	435	1371
1 to 2 pm	112	405	224	381	1122
2 to 3 pm	125	417	295	424	1261
3 to 4 pm	118	364	94	289	865
4 to 5 pm	145	465	156	215	981
5 to 6 pm	65	561	197	229	1052
6 to 7 pm	91	284	110	233	718

Table 12

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	245	315	156	101	817
9 to 10am	215	389	136	107	847
10 to 11 am	371	289	101	74	835
11 to 12pm	381	259	126	107	873
12 to 1 pm	365	362	105	91	923
1 to 2 pm	435	399	139	65	1038
2 to 3 pm	435	354	211	126	1126
3 to 4 pm	265	215	124	90	694
4 to 5 pm	297	365	195	165	1022
5 to 6 pm	234	397	165	124	920
6 to 7 pm	165	198	131	39	533
Table 13					

Time	A to B	A to C	A to D	A to A	Total(PCU)
8 to 9 am	609	91	515	98	1313
9 to 10am	685	179	561	197	1622
10 to 11 am	643	126	615	191	1575
11 to 12 pm	609	166	429	124	1328
12 to 1 pm	695	132	481	175	1483
1 to 2 pm	681	124	501	102	1408
2 to 3 pm	811	151	433	139	1534
3 to 4 pm	741	114	604	126	1585
4 to 5 pm	615	135	582	115	1447
5 to 6 pm	631	156	456	92	1335
6 to 7 pm	449	65	425	75	1014

Table 14

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	115	565	316	300	1296
9 to 10am	186	598	329	398	1511
10 to 11 am	192	456	128	498	1274
11 to 12 pm	165	405	149	470	1196
12 to 1 pm	125	496	354	451	1426
1 to 2 pm	128	430	249	422	1229
2 to 3 pm	115	429	352	474	1370
3 to 4 pm	112	348	128	265	853
4 to 5 pm	113	449	156	215	933
5 to 6 pm	85	625	198	239	1147
6 to 7 pm	97	323	100	264	784

Table15



## Road D

Day 5

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	289	306	184	140	919
9 to 10am	271	406	136	99	912
10 to 11 am	348	298	124	106	876
11 to 12 pm	379	291	117	109	896
12 to 1 pm	398	343	129	131	1001
1 to 2 pm	435	419	162	95	1141
2 to 3 pm	431	365	221	120	1137
3 to 4 pm	259	265	131	108	763
4 to 5 pm	289	333	156	169	947
5 to 6 pm	269	389	194	149	1001
6 to 7 pm	151	194	125	67	537

Table 16

## Road A

Day 6

Time	A to B	A to C	A to D	A to A	Total(PCU)
8 to 9 am	765	109	602	199	1675
9 to 10am	645	198	556	201	1600
10 to 11 am	613	193	582	156	1544
11 to 12 pm	641	124	469	104	1338
12 to 1 pm	769	187	597	114	1667
1 to 2 pm	707	192	546	116	1561
2 to 3 pm	805	165	489	121	1580
3 to 4 pm	765	109	599	82	1555
4 to 5 pm	626	169	628	129	1549
5 to 6 pm	656	102	572	107	1437
6 to 7 pm	554	65	405	65	1089

Table 17

## Road B

Day 6

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	164	585	289	265	1303
9 to 10am	156	525	354	402	1437
10 to 11 am	124	365	124	496	1109
11 to 12 pm	140	506	105	387	1138
12 to 1 pm	121	454	365	465	1405
1 to 2 pm	125	382	204	495	1206
2 to 3 pm	125	431	325	456	1337
3 to 4 pm	101	395	94	302	892
4 to 5 pm	154	468	169	245	1036
5 to 6 pm	59	589	190	210	1048
6 to 7 pm	91	325	110	262	788

Table 18

## Road D

Day 6

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	296	362	195	164	1017
9 to 10am	202	389	165	125	881
10 to 11 am	386	305	125	69	885
11 to 12 pm	379	296	102	165	942
12 to 1 pm	329	354	165	105	953
1 to 2 pm	440	416	125	118	1099
2 to 3 pm	436	354	225	125	1140
3 to 4 pm	225	281	116	89	711
4 to 5 pm	285	325	156	160	926
5 to 6 pm	262	346	185	127	920
6 to 7 pm	191	169	130	67	557

Table 19

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	765	125	531	186	1607
9 to 10am	656	165	578	159	1558
10 to 11 am	665	193	525	162	1545
11 to 12 pm	656	165	469	154	1444
12 to 1 pm	785	154	602	165	1706
1 to 2 pm	695	102	556	112	1465
2 to 3 pm	789	165	535	135	1624
3 to 4 pm	756	116	588	95	1555
4 to 5 pm	626	152	605	138	1521
5 to 6 pm	654	109	526	114	1403
6 to 7 pm	472	87	489	85	1133

Table 20

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	164	562	301	268	1295
9 to 10am	186	506	312	401	1405
10 to 11 am	129	359	165	564	1217
11 to 12 pm	165	516	128	424	1233
12 to 1 pm	136	424	336	406	1302
1 to 2 pm	156	415	271	431	1273
2 to 3 pm	131	430	312	451	1324
3 to 4 pm	116	347	106	289	858
4 to 5 pm	181	426	156	297	1060
5 to 6 pm	50	596	197	220	1063
6 to 7 pm	89	347	91	234	761

Table 21

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	286	365	156	121	928
9 to 10am	264	398	156	117	935
10 to 11 am	386	292	115	85	878
11 to 12 pm	379	299	125	111	914
12 to 1 pm	356	343	129	103	931
1 to 2 pm	409	400	136	99	1044
2 to 3 pm	435	315	211	120	1081
3 to 4 pm	225	265	124	113	727
4 to 5 pm	277	394	165	169	1005
5 to 6 pm	265	344	154	145	908
6 to 7 pm	201	210	122	65	598

Table 22

Time	A to B	A to C	A to D	A to A	Total(PCU)
8 to 9 am	766	130	556	156	1608
9 to 10am	688	172	605	156	1621
10 to 11 am	622	156	515	135	1428
11 to 12 pm	609	126	426	162	1323
12 to 1 pm	725	145	603	145	1618
1 to 2 pm	691	121	559	112	1483
2 to 3 pm	804	126	485	144	1559
3 to 4 pm	722	154	656	85	1617
4 to 5 pm	685	162	601	131	1579
5 to 6 pm	636	126	526	91	1379
6 to 7 pm	525	103	435	85	1148

Table 23

Road B

Day 8

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	95	529	306	298	1228
9 to 10am	185	495	312	398	1390
10 to 11 am	135	381	119	495	1130
11 to 12 pm	145	490	110	415	1160
12 to 1 pm	139	439	326	434	1338
1 to 2 pm	165	426	265	409	1265
2 to 3 pm	121	416	321	453	1311
3 to 4 pm	119	365	101	306	891
4 to 5 pm	135	465	156	259	1015
5 to 6 pm	59	592	198	217	1066
6 to 7 pm	72	399	125	251	847

Table 24



Road D

Day 8

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	279	337	168	115	899
9 to 10am	222	409	122	102	855
10 to 11 am	379	300	115	145	939
11 to 12 pm	408	306	111	125	950
12 to 1 pm	403	345	129	136	1013
1 to 2 pm	425	405	145	95	1070
2 to 3 pm	464	333	198	110	1105
3 to 4 pm	223	264	105	115	707
4 to 5 pm	302	326	156	165	949
5 to 6 pm	265	365	190	102	922
6 to 7 pm	190	215	126	59	590

Table 25

Time	A to B	A to C	A to D	A to A	Total(PCU)
8 to 9 am	612	118	535	158	1423
9 to 10am	635	149	591	187	1562
10 to 11 am	663	116	525	177	1481
11 to 12 pm	595	138	456	115	1304
12 to 1 pm	692	165	551	177	1585
1 to 2 pm	681	148	565	152	1546
2 to 3 pm	786	171	438	139	1534
3 to 4 pm	721	131	598	136	1586
4 to 5 pm	665	122	582	135	1504
5 to 6 pm	661	136	496	104	1397
6 to 7 pm	429	75	395	65	964

Road A

Day 9

Table 26

Road B

Day 9

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	102	545	313	290	1250
9 to 10am	162	521	305	393	1381
10 to 11 am	125	406	145	500	1176
11 to 12 pm	136	498	141	409	1184
12 to 1 pm	135	445	321	428	1329
1 to 2 pm	122	418	239	403	1182
2 to 3 pm	165	426	317	449	1357
3 to 4 pm	121	365	145	300	931
4 to 5 pm	126	441	156	253	976
5 to 6 pm	86	590	197	211	1084
6 to 7 pm	103	301	130	246	690

Table 27

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	272	330	185	110	897
9 to 10am	215	402	130	103	850
10 to 11 am	372	293	120	94	879
11 to 12 pm	401	299	129	115	944
12 to 1 pm	396	338	145	97	976
1 to 2 pm	418	407	141	87	1053
2 to 3 pm	457	331	206	113	1107
3 to 4 pm	216	255	117	94	682
4 to 5 pm	295	353	156	147	951
5 to 6 pm	260	385	197	105	947
6 to 7 pm	183	206	121	87	597

Table 28

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	750	105	535	190	1580
9 to 10am	710	154	585	165	1614
10 to 11 am	661	193	531	184	1569
11 to 12 pm	644	124	506	132	1406
12 to 1 pm	785	172	585	139	1681
1 to 2 pm	706	192	546	125	1569
2 to 3 pm	829	135	508	130	1602
3 to 4 pm	717	144	585	114	1560
4 to 5 pm	646	195	621	142	1604
5 to 6 pm	685	125	507	121	1438
6 to 7 pm	536	91	452	85	1164

Road A

Day 10

Table 29

Road B

Day 10

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	124	489	305	295	1213
9 to 10am	156	524	328	400	1408
10 to 11 am	165	403	115	507	1190
11 to 12 pm	145	498	126	416	1185
12 to 1 pm	142	425	325	435	1327
1 to 2 pm	136	412	249	410	1207
2 to 3 pm	138	456	309	456	1359
3 to 4 pm	102	388	114	305	909
4 to 5 pm	165	452	174	258	1049
5 to 6 pm	86	545	188	218	1037
6 to 7 pm	105	369	110	252	836

Table 30

Road D

Day 10

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	268	326	165	114	873
9 to 10am	211	398	128	107	844
10 to 11 am	368	289	108	98	863
11 to 12 pm	397	295	119	119	930
12 to 1 pm	392	334	125	101	952
1 to 2 pm	414	403	142	91	1050
2 to 3 pm	453	327	202	117	1099
3 to 4 pm	212	251	107	98	668
4 to 5 pm	291	349	165	151	956
5 to 6 pm	256	381	179	109	925
6 to 7 pm	179	202	101	43	525

Table 31

Time	A to B	A to C	A to D	A to A	Total(PCU)
8 to 9 am	658	105	532	171	1416
9 to 10am	725	175	583	178	1661
10 to 11 am	613	142	531	129	1425
11 to 12 pm	641	145	499	120	1405
12 to 1 pm	765	130	582	140	1617
1 to 2 pm	709	132	567	124	1532
2 to 3 pm	785	146	501	136	1568
3 to 4 pm	741	118	599	101	1559
4 to 5 pm	626	162	613	136	1537
5 to 6 pm	666	107	517	112	1402
6 to 7 pm	498	81	453	56	1088

Road A

Day 11

Table 32

## Road B

Day 11

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	104	526	298	288	1216
9 to 10am	168	498	321	391	1378
10 to 11 am	129	389	108	498	1124
11 to 12 pm	139	495	119	407	1160
12 to 1 pm	136	434	318	426	1314
1 to 2 pm	128	403	242	401	1174
2 to 3 pm	129	427	302	447	1305
3 to 4 pm	112	351	107	298	868
4 to 5 pm	131	449	165	251	996
5 to 6 pm	56	581	179	209	1025
6 to 7 pm	79	302	101	243	725

Table 33



Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	257	315	156	164	892
9 to 10am	200	387	117	127	831
10 to 11 am	364	278	99	118	859
11 to 12 pm	386	284	108	129	907
12 to 1 pm	381	323	114	121	939
1 to 2 pm	403	395	131	111	1040
2 to 3 pm	442	316	209	137	1104
3 to 4 pm	205	240	121	128	694
4 to 5 pm	280	338	145	171	892
5 to 6 pm	245	370	181	129	925
6 to 7 pm	168	191	133	64	556

Table 34

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	710	112	529	181	1532
9 to 10am	670	182	580	188	1620
10 to 11 am	621	149	528	139	1437
11 to 12 pm	604	150	496	130	1380
12 to 1 pm	742	137	579	150	1608
1 to 2 pm	685	139	564	134	1522
2 to 3 pm	807	153	498	146	1604
3 to 4 pm	704	125	596	111	1536
4 to 5 pm	645	169	610	146	1570
5 to 6 pm	660	114	514	122	1410
6 to 7 pm	492	88	450	76	1106

Road A

Day 12

Table 35

Road B

Day 12

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	126	551	324	256	1257
9 to 10am	193	521	346	360	1420
10 to 11 am	154	405	133	469	1161
11 to 12 pm	164	516	144	386	1210
12 to 1 pm	159	455	343	401	1358
1 to 2 pm	152	428	262	385	1227
2 to 3 pm	154	452	318	426	1350
3 to 4 pm	145	376	135	264	920
4 to 5 pm	156	474	190	226	1046
5 to 6 pm	109	607	184	205	1105
6 to 7 pm	89	327	123	228	767

Table 36

Road D

Day 12

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	280	392	160	119	951
9 to 10am	223	410	123	112	868
10 to 11 am	380	301	113	103	897
11 to 12 pm	409	308	114	124	955
12 to 1 pm	404	346	120	106	976
1 to 2 pm	426	415	139	96	1076
2 to 3 pm	465	339	196	122	1039
3 to 4 pm	224	263	102	103	692
4 to 5 pm	304	356	160	156	976
5 to 6 pm	265	393	174	114	946
6 to 7 pm	179	214	96	48	537

Table 37

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	710	112	529	181	1532
9 to 10am	670	182	580	188	1620
10 to 11 am	621	149	528	139	1437
11 to 12 pm	604	150	496	130	1380
12 to 1 pm	742	137	579	150	1608
1 to 2 pm	685	139	564	134	1522
2 to 3 pm	807	153	498	146	1614
3 to 4 pm	704	125	596	111	1536
4 to 5 pm	645	169	610	146	1570
5 to 6 pm	660	114	514	122	1410
6 to 7 pm	492	88	450	76	1106

Road A

Day13

Table 38

Road B

Day 13

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	115	496	301	281	1193
9 to 10am	165	511	312	389	1269
10 to 11 am	115	396	131	504	1146
11 to 12 pm	146	465	112	404	1127
12 to 1 pm	151	464	321	435	1372
1 to 2 pm	112	405	224	381	1122
2 to 3 pm	125	417	295	424	1261
3 to 4 pm	118	364	94	289	865
4 to 5 pm	145	465	156	215	982
5 to 6 pm	65	561	197	229	1052
6 to 7 pm	91	284	110	233	718

Table 39

## Road D

Day 13

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	245	315	156	131	847
9 to 10am	215	389	136	107	856
10 to 11 am	371	289	101	94	855
11 to 12 pm	381	259	126	107	873
12 to 1 pm	365	362	105	115	947
1 to 2 pm	435	399	139	85	1058
2 to 3 pm	435	354	211	126	1126
3 to 4 pm	265	215	124	131	735
4 to 5 pm	297	365	195	165	1022
5 to 6 pm	234	397	165	124	920
6 to 7 pm	165	198	131	63	557

Table 40

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	651	107	571	195	1524
9 to 10am	689	175	596	163	1623
10 to 11 am	691	165	428	162	1446
11 to 12 pm	619	114	456	109	1298
12 to 1 pm	652	128	581	129	1490
1 to 2 pm	795	131	556	112	1594
2 to 3 pm	717	153	477	153	1500
3 to 4 pm	755	117	569	101	1542
4 to 5 pm	685	159	607	117	1568
5 to 6 pm	620	114	551	121	1406
6 to 7 pm	512	89	414	71	1086

Road A

Day 14

Table 41



Road B

Day 14

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	164	562	301	268	1295
9 to 10am	186	506	312	401	1405
10 to 11 am	129	359	165	564	1217
11 to 12 pm	165	516	128	424	1233
12 to 1 pm	136	424	336	406	1302
1 to 2 pm	156	415	271	431	1273
2 to 3 pm	131	430	312	451	1324
3 to 4 pm	116	347	106	289	858
4 to 5 pm	181	426	156	297	1060
5 to 6 pm	50	596	197	220	1063
6 to 7 pm	89	347	91	234	761

Table 42

Road D

Day 14

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	291	341	154	131	917
9 to 10am	212	389	142	111	854
10 to 11 am	290	244	104	106	744
11 to 12 pm	391	226	124	105	846
12 to 1 pm	432	341	139	97	1009
1 to 2 pm	404	391	161	71	1027
2 to 3 pm	435	335	200	128	1098
3 to 4 pm	231	268	115	101	715
4 to 5 pm	295	353	165	148	255
5 to 6 pm	285	399	197	105	1091
6 to 7 pm	164	195	84	59	502

Table 43

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	687	98	545	164	1494
9 to 10am	678	160	512	218	1568
10 to 11 am	690	196	413	165	1464
11 to 12 pm	676	90	518	108	1392
12 to 1 pm	612	157	580	121	1470
1 to 2 pm	768	163	576	122	1629
2 to 3 pm	695	187	478	178	1538
3 to 4 pm	707	198	561	90	1556
4 to 5 pm	645	176	627	147	1595
5 to 6 pm	670	136	596	123	1525
6 to 7 pm	490	114	456	108	1168

Road A

Day 15

Table 44

Road B

Day15

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	165	526	310	286	1287
9 to 10am	168	560	321	410	1459
10 to 11 am	192	395	156	546	1289
11 to 12 pm	156	561	182	434	1333
12 to 1 pm	163	442	363	460	1428
1 to 2 pm	165	451	217	413	1246
2 to 3 pm	135	403	321	415	1274
3 to 4 pm	161	374	160	267	962
4 to 5 pm	118	462	165	256	1001
5 to 6 pm	78	568	179	297	1122
6 to 7 pm	94	374	123	254	845

Table 45

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	267	321	132	156	876
9 to 10am	217	323	178	138	856
10 to 11 am	254	232	123	160	769
11 to 12 pm	354	265	142	150	911
12 to 1 pm	478	356	193	105	1132
1 to 2 pm	432	345	116	112	1005
2 to 3 pm	435	351	207	142	1135
3 to 4 pm	236	234	145	123	738
4 to 5 pm	223	377	132	184	876
5 to 6 pm	229	322	179	150	880
6 to 7 pm	155	121	91	63	390

Table 46

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	596	93	531	175	1395
9 to 10am	669	172	576	153	1570
10 to 11 am	645	197	428	162	1432
11 to 12 pm	587	121	444	129	1281
12 to 1 pm	652	166	545	132	1495
1 to 2 pm	702	156	556	112	1526
2 to 3 pm	677	163	472	163	1475
3 to 4 pm	705	137	545	91	1478
4 to 5 pm	645	149	587	117	1498
5 to 6 pm	580	104	545	132	1361
6 to 7 pm	512	79	395	56	1042

Table 47

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	128	532	312	248	1220
9 to 10am	176	496	334	391	1397
10 to 11 am	129	343	276	448	1196
11 to 12 pm	165	504	143	432	1244
12 to 1 pm	128	414	356	397	1295
1 to 2 pm	164	493	292	322	1271
2 to 3 pm	148	437	332	382	1299
3 to 4 pm	118	347	243	287	995
4 to 5 pm	165	406	356	264	1191
5 to 6 pm	87	487	295	218	1087
6 to 7 pm	68	347	221	124	760

Table 48

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	264	379	124	121	888
9 to 10am	273	369	132	106	880
10 to 11 am	296	232	94	106	728
11 to 12 pm	375	243	115	121	854
12 to 1 pm	434	354	143	98	1029
1 to 2 pm	398	391	176	84	1049
2 to 3 pm	454	356	214	119	1143
3 to 4 pm	276	287	143	91	797
4 to 5 pm	265	345	168	128	706
5 to 6 pm	243	375	172	115	905
6 to 7 pm	187	165	79	65	496

Table 49



Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	559	119	568	175	1421
9 to 10am	679	148	576	149	1552
10 to 11 am	691	156	458	154	1459
11 to 12 pm	639	104	467	109	1319
12 to 1 pm	612	122	592	114	1440
1 to 2 pm	765	116	564	122	1567
2 to 3 pm	697	134	479	143	1453
3 to 4 pm	746	112	554	98	1510
4 to 5 pm	621	146	609	103	1479
5 to 6 pm	680	124	551	118	1473
6 to 7 pm	512	76	396	68	1052

Table 50

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	144	532	314	254	1244
9 to 10am	166	488	332	381	1367
10 to 11 am	109	376	205	464	1154
11 to 12 pm	175	512	185	343	1215
12 to 1 pm	128	432	306	376	1249
1 to 2 pm	143	409	287	398	1237
2 to 3 pm	121	412	343	376	1252
3 to 4 pm	116	365	125	265	871
4 to 5 pm	151	434	178	247	1010
5 to 6 pm	70	565	212	180	1027
6 to 7 pm	85	357	87	134	663

Table 51

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	278	354	132	128	892
9 to 10am	207	365	154	107	833
10 to 11 am	265	274	107	115	761
11 to 12 pm	378	286	111	102	877
12 to 1 pm	445	351	116	97	1009
1 to 2 pm	404	398	145	112	1059
2 to 3 pm	421	354	197	132	1104
3 to 4 pm	331	276	134	109	850
4 to 5 pm	315	332	156	132	935
5 to 6 pm	325	376	187	95	983
6 to 7 pm	264	214	92	69	639

Table 52

Time	A to B	A to C	A to D	A to A	Total (PCU)
8 to 9 am	564	118	598	176	1456
9 to 10am	654	165	576	149	1544
10 to 11 am	688	149	445	142	1424
11 to 12 pm	624	124	476	115	1339
12 to 1 pm	665	132	576	107	1480
1 to 2 pm	745	126	532	119	1522
2 to 3 pm	707	141	487	133	1468
3 to 4 pm	732	119	549	98	1498
4 to 5 pm	697	145	614	112	1568
5 to 6 pm	665	124	543	118	1450
6 to 7 pm	532	76	410	87	1105

Table 53

Time	B to C	B to D	B to A	B to B	Total (PCU)
8 to 9 am	132	565	323	243	1263
9 to 10am	145	512	476	287	1420
10 to 11 am	129	408	373	454	1364
11 to 12 pm	115	523	297	324	1259
12 to 1 pm	96	445	396	266	1203
1 to 2 pm	166	475	348	231	1250
2 to 3 pm	143	454	383	351	1331
3 to 4 pm	123	398	132	232	885
4 to 5 pm	178	565	187	212	1142
5 to 6 pm	78	603	217	198	1096
6 to 7 pm	92	394	198	109	793

Table 54

Time	D to A	D to B	D to C	D to D	Total (PCU)
8 to 9 am	212	361	134	124	831
9 to 10am	223	376	112	118	829
10 to 11 am	287	267	94	109	757
11 to 12 pm	365	287	118	117	887
12 to 1 pm	423	367	123	102	1015
1 to 2 pm	394	386	154	85	1019
2 to 3 pm	418	375	176	92	1061
3 to 4 pm	310	270	109	88	777
4 to 5 pm	287	338	145	128	898
5 to 6 pm	245	419	128	95	887
6 to 7 pm	187	205	84	54	530

Table 55

## **CHAPTER 10: ORIGIN AND DESTINATION STUDIES**

The origin and destination is mainly carried out to plan the road network and other facilities for vehicular traffic. The O&D study of vehicular traffic determines their number, their origin and destination in each study zone. The data is also supplemented by number of people in each vehicle, intermediate stops made and reasons etc. Origin and destination study gives information like actual direction of travel, selection of route, time usually taken to reach destination etc. These studies are important in improving some existing systems as well as planning new highway facilities.

There are a number of methods that can be employed for collecting O&D data. Some of the commonly adopted methods are:-

- 1 Road side interview method.
- 2 License plate method.
- 3 Return post card method.
- 4 Tag on car method.
- 5 Home interview method

During this project O&D study was being carried out. In this, survey was done on more than 50 people where the method employed was road side interview method and home interview method. After performing the survey certain results were obtained.

## OBSERVATIONS FROM O&D STUDY

**Question** - What was the most travelled route for people?

**Answer** - It was found out to be from B to D and D to B, because most people have their Workplace as well as schools located over there.

**Question** - What is the most severe problem people are facing in the area?

**Answer** - It was found out that people have started the experience severe traffic jams in the Area. This was mainly due to congestion.

**Question** - What is the time delay for people now days?

**Answer** - The increase in time delay is about 200 %. There are stagnant traffic jams and to cover just 1 km it takes 15 – 20 minutes now.

**Question** - What do people think is the cause for this?

**Answer** - According to the locals residing there, the main cause behind this is local bus drivers who are mainly responsible for these traffic jams along with poor traffic management by the police.

**Question** - Some other problems people have started facing recently?

**Answer** - According to the survey it was found out that number of accidents have increased in the area.

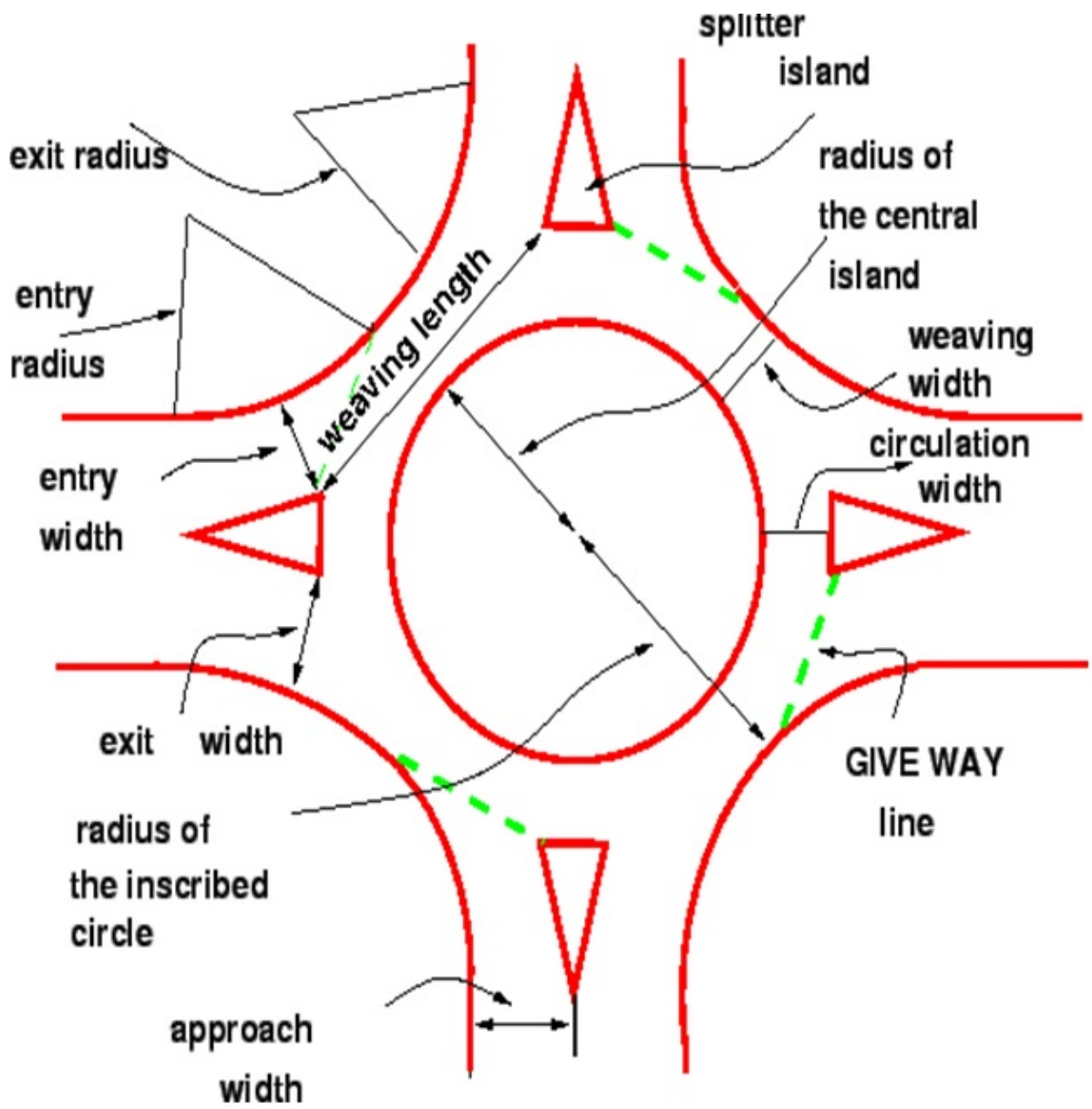


## CHAPTER 11: THEORETICAL DESIGN OF ROTARY

A theoretical design of traffic rotary for Sanjauli Chowk is being prepared keeping in view the IRC recommendations for hilly terrain and the given design is prepared

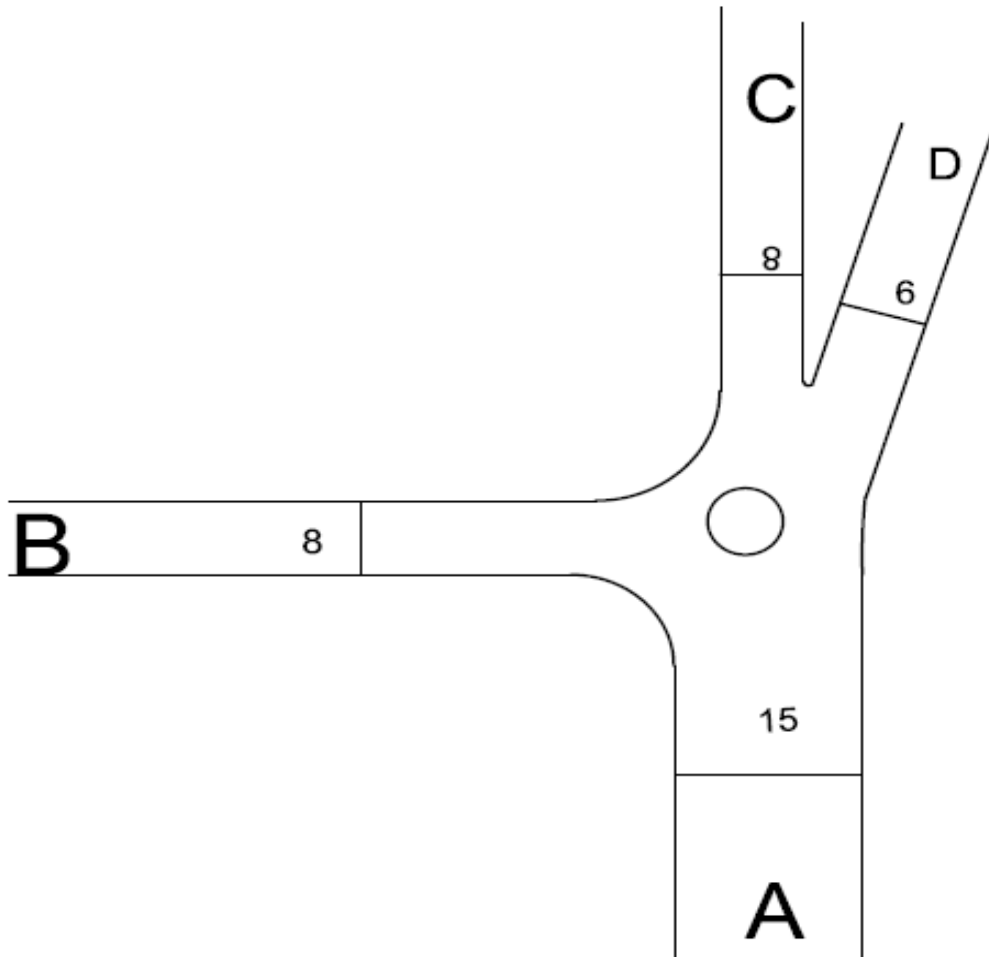
<b>SNO.</b>	<b>PARTICULARS</b>	<b>Value</b>
1	Shape of the central island	Circular
2	Design speed for mountainous terrain	30 kmph
3	Minimum radius of horizontal curve	15.07m
4	Value of friction coefficient	0.47
5	Radius of entry curve	15m
6	Radius of exit curve	22.5m
7	Width of entry ( $e_1$ )	6.5m
8	Width of non-weaving section ( $e_2$ )	6.5m
9	Width of weaving section (W)	10.0m
10	Length of weaving section (L)	40.0m
11	Weaving Ratio (P)	0.6
12	Practical Capacity of Rotary	<b>2957PCU/hr</b>

Table 56



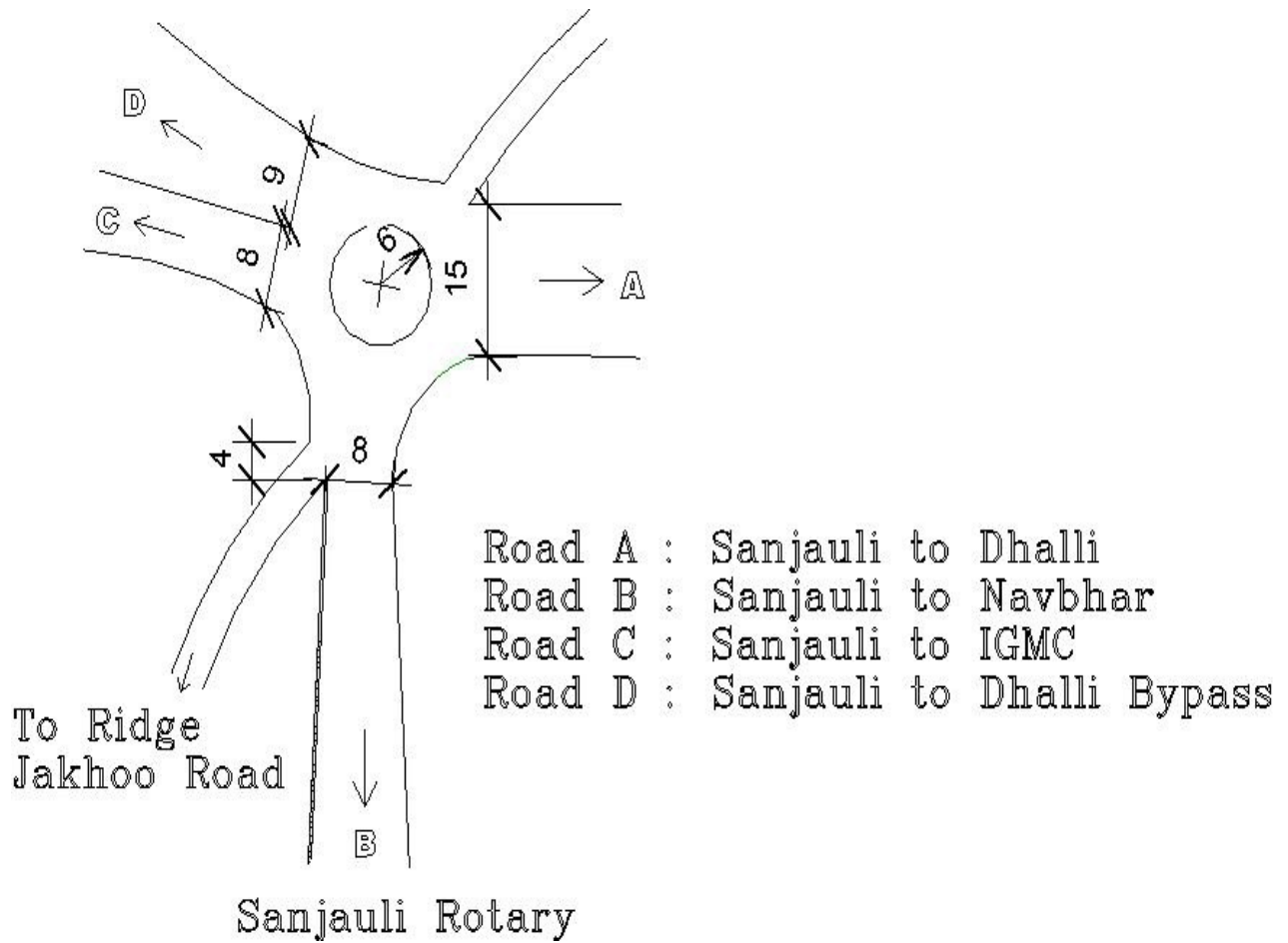
**Fig6. Traffic Rotary**

## CHAPTER 12: AUTO CAD DESIGN



**Fig7. Auto Cad Drawing of Sanjauli Chowk**

## CHAPTER 13: REVIT DESIGN



**Fig8. Revit Design of Rotary intersection at Sanjauli Chowk**

## CHAPTER 14: PROJECT SCHEDULE

<b>SNO.</b>	<b>ACTIVITY</b>	<b>TIME TAKEN</b>
1	Literature Review	August 2016
2	Preliminary site survey	August-September 2016
3	Traffic volume study(part1)	September2016
4	Origin and Destination study	October 2016
5	Traffic volume study(part2)	November - December2016
6	Drawing Layout	January 2017
7	Traffic volume study(part3)	February-March 2017
8	Analysis by Software	March-April2017

Table 57

## **CHAPTER 15: OBSERVATIONS & CONCLUSIONS**

The following observations and conclusions were obtained from the project:-

- 1 The peak hour traffic volume of the intersection was found out to be 2957 PCU per hour. This volume of traffic area study area requires appropriate handling of traffic that can be achieved by designing of traffic rotary at Sanjauli Chow
- 2 The maximum volume that a traffic rotary can handled efficiently can be taken as about 3000 vehicles per hour entering from all intersection legs.
- 3 Necessary widening on all the legs of the intersection should be provided
- 4 Intersections should be provided on a level ground.
- 5 Traffic rotary construction reduces the area of conflict between intersecting traffic streams and promotes orderly and safe movement
- 6 For better working of traffic rotary encroachments have to be removed on all the legs of intersection.
- 7 The adequate lighting of intersections especially with channelizing islands is essential in urban areas. Lighting should be done as to make the entire island and intersection area visible even in bad weather
- 8 The parking of vehicles must not be allowed at the intersections.
- 9 Necessary traffic signs and pavement markings need to be provided at the intersection. Also, signs with reflective properties, preferably retro reflective type, are to be used so as to meet the requirements of night traffic.

## CHAPTER 16: REFERENCES

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