2019

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

American Society of Civil Engineers (ASCE) Mid-Pacific Conference Transportation Competition

Summary Report

Prepared for:

CITY OF SAN JOSE CAPITAL OF SILICON VALLEY

CITY OF SAN JOSE CALIFORNIA

Transportation Challenge Team
Zhejiang University, Hangzhou

Team Members:

Reachsak Ly
Y. S. Yu
Y. N. Dong.
L. T. Shen
M. S. Geng
C. Wang

CONTENTS

1 Introduction

1.1 Background

In order to handle safety hazard and improve the public transport service, San Jose has adopted Vision Zero transportation safety initiative in which the goal is to eliminate fatalities and reduce injuries caused by traffic collisions.

East Santa Clara Street is a main arterial street in downtown San Jose which provides primary access to the people in the area, especially the students of SJSU and also the San Jose City hall. Thus, there is a noticeable high traffic volume in the area which causes some inconvenience to the travelers. There also aren't any specific travel lanes for bikes and buses, which usually cause traffic congestion in the area, especially at the intersections. Our team has come up with a suitable design to solve these problems with the purpose of trying to make the Santa Clara street safer, less congested and providing a more efficient traffics to the area.

1.2 Status Analysis

East Santa Clara Street is currently consisting of four vehicle lanes and a parking lane at each side. In the present time, the street is still believed to be able to handle the traffic demand, but according to the expected calculation, some

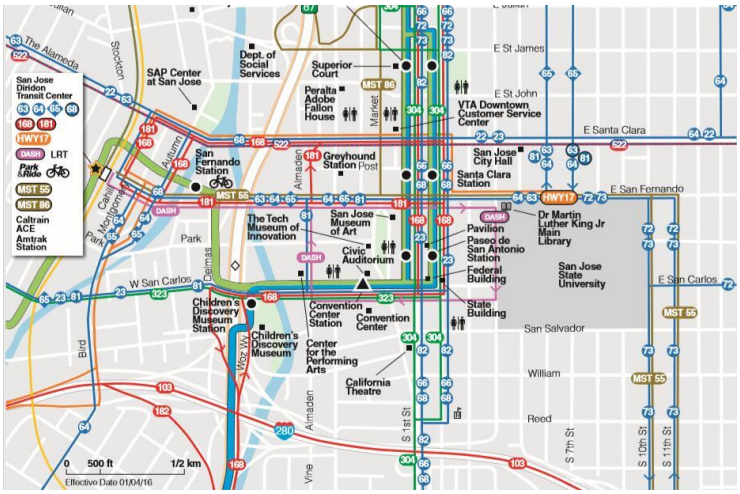


Figure 1. Bus Route

sections of the street may fail to meet the traffic requirement in the future. At the same time, there are currently four bus routes running in this area. Since the promotion of bike usage, we can see that the influence of cyclists to the area's traffic is also increasing. From our analysis, the current public transit is a bit complicated and sort of disordered, which may be dangerous for travelers and restricts the transport capacity to some extent. For this reason, our team has decided to make an improvement to the current signal timing and phasing and also introduce the new bus-bike shared lane. The purpose is to solve the existing problems, to make the traffic more organized, more efficient and to ensure the safety for the travelers.

1.3 Scope

As shown in the Fig 2, the scope is from the intersection of Santa Clara Street and San Pedro Street to the intersection of East Santa Clara Street and North 6th Street, which includes roadways extending 100 feet from the stop bar or yield line in each direction.

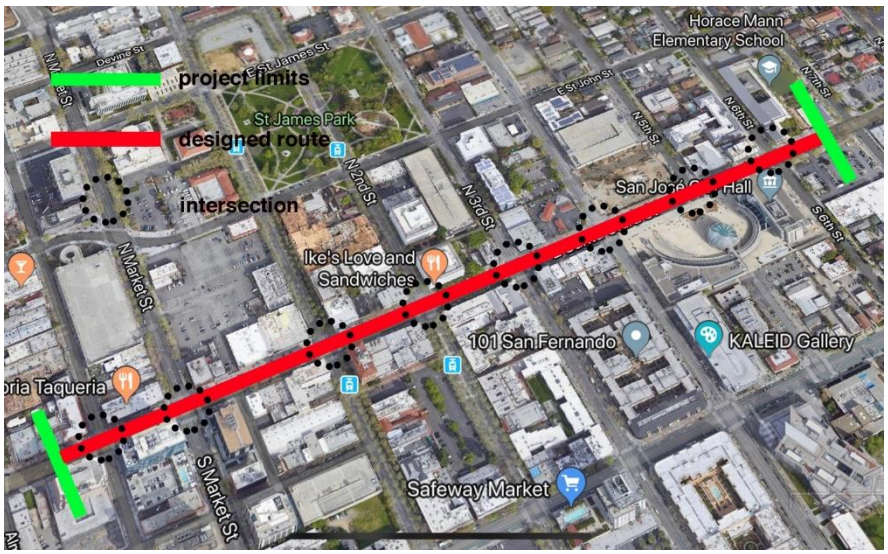


Fig 2. Layout of our design

2 Design Method

Starting from the intersection of San Petro Street and West Santa Clara Street to the intersection of North 6th Street and East Santa Clara street, the design has made some changes to traffic signs by removing, relocating or adding required ones. Bus-bike shared lane is also introduced alongside with optimized level of services of each intersection. The main site plan, details of the bus-bike shared lane, bus stops, typical cross section and detail sheets are all provided in the Appendix A.

2.1 Alignment Design

The whole project was designed by taking a reference to the *AASHTO* and the design of the bus-bike shared lane from *NACTO*.

Changes have been made to the lanes on the main Santa Clara Street and the bus stops have been redesigned while keeping the one-way nature and direction of the North 1st, North 2nd, North 3rd, North 4th, the tramroads and the bus stops remain unchanged.

The details of the changes made are as following:

1) Santa Clara Street has become a four-lane street with 2 lanes for vehicles and 2 bus-bike shared lanes and still keeping the two additional parking lanes on both sides. Noted that at the intersection the two vehicle lanes will turn to three lanes to meet the need of Channelization at the intersections.
2) Bus stations within the area have been transformed. The detailed new design plan is shown in Appendix A

3) At each bus stop, the width of different lanes on the street has been changed. An exclusive bike lane marked in green which wraps around the bus stop is introduced. And the width of the sidewalk is reduced to make room for the bus stops and the separate bike lane mentioned above.
4) To ensure the safety of the cyclists when they are crossing the intersection, special bicycle zebra crossings have been added, which are marked in green on the site plan. For more details, please refer to the site plan in Appendix A**.**
5) At some intersections, in order to meet the traffic requirements for right-turn vehicles and improve the service level, spaces at the far end of the parking lanes have been designed to a Right-turn pocket and the far-end of the two parking lanes will be used as lanes for vehicles waiting for making right turns.
6) The two-way left turn lane has been designed for the street within the intersection of North 5th street and 6th Street section.
7) New signage and street pavement markings are added. Please refer to Appendix A.

2.2 Cross Section Design

As we know, it is necessary to define the thickness of the road structure. The traffic data was used to calculate the load acting on the road after 20 years with the average annual growth rate (2%) and the minimum thickness of road structure layer was calculated by referring to *HDM* (Highway Design Manual) and *AASHTO* (American Association of State Highway and

Transportation Officials). We also use open source software to help with calculation. It was assumed that the structure of the road in the design period could satisfy the load demand.

The designed pavement adopts the traditional three-layer pavement structure. The material of the surface layer is hot mix asphalt (HMA) and the aggregate base beneath the surface layer is combined with lime industrial waste residue stable soil, which is called macadam foundation. The subgrade is combined with subgrade earthwork which was appropriately compacted

The calculation is under such assumptions or facts that: Function of Santa Clara Street is determined to be an urban collector; according to the traffic data, the highest traffic volume (two-way AADT) is 849; the soil type is selected to be A-1-a; the thickness of the aggregated base is assumed to be 8 inches. The thickness of the hot mix asphalt is calculated to be 5.5 inches. So, the assumed pavement structure is presented in the table below.

Table 1. Layer Thickness

Layer thicknesses		
Layer	**Type**	**Thickness(inches)**
Surface	Hot mix asphalt	5.5
Aggregate base	Lime industrial waste residue stable soil	8
Subgrade	Appropriately compacted subgrade earthwork	/

The road arch transverse slope is designed to be 2% for drainage and the specific cross-sections are presented in Appendix A.

We also provide four typical cross sections within our whole design which shown in the Appendix A. Each typical section symbol is also displayed in the main layout sheets.

2.3 Profile Design

The profile of a road refers to the vertical section along the center line of the road and It indicates the topography along the road. The elevation information of the original ground line from the intersection of Santa Clara Street and San Pedro Street to the intersection of East Santa Clara Street and North 6th Street and the new road surface is shown in the profile sheets. We obtain the elevation information from Google Earth Pro which is accurate to feet. The stack number information is read from the base map. According to the Highway Design Manual- Sixth Edition, we can determine the profile of the new road. The change in height is very small which is very reasonable because this road has already existed, so we choose the grade 0.3 percent and there is no need to change the grades. Please refer to Appendix A for details.

2.4 Bus Stop Design

The dedicated curbside bus stop was chosen in this design. The lane marked in red with the "BUS ONLY". At this point, a separate bike lane is provided just behind the bus stop to ensure that the traffic of bicycles is not affected when buses stop at the station. The two, bus lane and bike lane, will merge after passing the bus stop section. And if the bus stop is very close to the intersection, the bus lane and the bike lane will not merge until passing the

intersection and the buses and bicycles are waiting in their respective lanes. For more details, please refer to the figure shown in Appendix A.

3 Sight Triangle

Intersection sight distance (ISD) refers to the corner sight distance available in intersection quadrants that allows a driver approaching an intersection to observe the actions of vehicles on the crossing leg(s). ISD evaluations involve establishing the needed sight triangle in each quadrant by determining the legs of the triangle on the two crossing roadways. Within this clear sight triangle, the objective is to remove or lower any object that obstructs the driver's view. The height of the eye for passenger cars is assumed to be 3.5 feet (1.080 m) above the surface of the minor road. The height of the object (approaching vehicle on the major road) is also assumed to be 3.5 feet (1.080 m). As there are not many trucks, the assumption of 3.5 feet is sufficient.

The necessary clear sight triangle is based on the type of traffic control at the intersection and on the design speeds of the two roadways. All of the intersections in the scope of our design are all signal controlled intersections with the design speed of 25mph in the main street. In this design we have provided the sight triangle figure for two possible conditions, the standard signalized controlled intersection and the signalized controlled intersection under two-way flash operation conditions.

1st Condition: Standard Signalized Controlled

At signalized intersections, provide sufficient sight distance from the stop bar so that the first vehicle on each approach is visible to all other approaches. With the signalized controlled intersection, we only consider the possibilities of collision between the vehicles on the minor (major) road who's making the right turn on red with the vehicle on the major (minor) road who will go straight on the green. All of the intersections in this project, the right-turn-red is allowed, thus we must ensure that the ISD for a stop-controlled right-turning vehicle is available to the left. The ISD is 280 feet and 15 feet for the vehicle who's making right turn.

2nd Condition: Two-way flash operation

In the two-way flash operation (i.e. flashing amber on the major road approaches and flashing red on the minor-road approaches) which the intersection is the off-peak or at the nighttime condition, we have provided the ISD criteria for a stop-controlled intersection. The ISD along the major road is 280 feet and 15 feet along the minor road. Please refer to Appendix A for more details.

4 Signal control

4.1 Assumption

Traffic volume data of eight signal-controlled intersections were collected in different years. Thus, with the Annual Growth Equalization hypothesis, we assume that the traffic

growth before 2019 is also the same as the assumption that was offered by competition for this project for a 20-year long estimation which is at 2%.

4.2 Prediction

With the given traffic growth 2% per year and 20 years' design life, the traffic volume in the future is predicted according to the procedure depicted in Fig 3. Take the intersection of North 1st Street & Santa Clara Street for example. The AM Peak volume of the intersection in 2014 and calculated traffic volume according to the assumption in 2019 and 2039 is presented in Table 2.

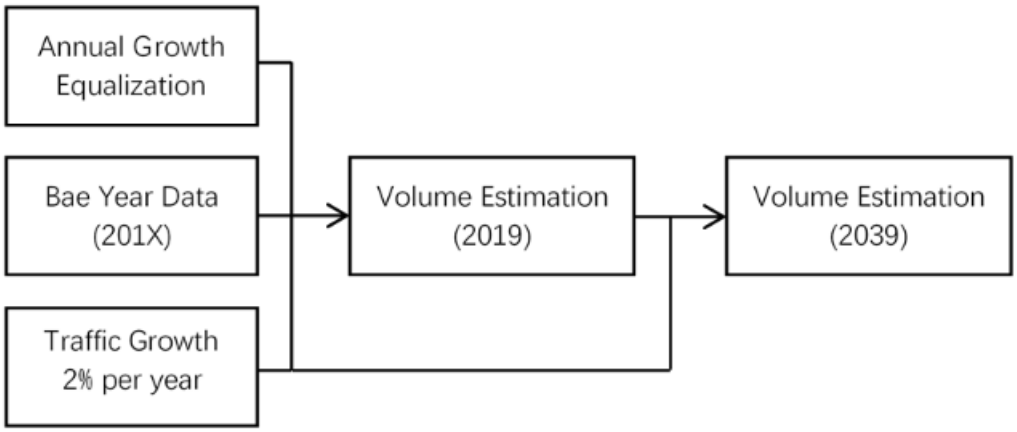


Fig 3. Prediction Procedure

Table 2. Original & Predicted Traffic Volume (veh/h).

AM Peak Data - Intersection of First St. & Santa Clara St.									
Year	NBLT	NBTH	NBRT	EBLT	EBTH	EBRT	WBLT	WBTH	WBRT
2014	21	199	26	54	514	0	0	662	41
2019	23	220	29	60	567	0	0	731	45
2039	34	328	43	89	845	0	0	1089	67

4.3 Control Type

On the basis of *TCM*, *HCM* and *HDM*, a fixed-time mode is chosen for all eight signal-controlled intersections. Offset coordination for signal groups on Santa Clara Street is also improved.

4.4 Phasing Plan

The phasing plan is designed and optimized based on original signal timing files of Santa Clara Street. Furthermore, permitted or protected Left-Turn phases are optimized for all signal-controlled intersections. The light-rail train has also been put into consideration and coordination with signal lights. The procedure is shown in Fig 4.

Fig 4. Phasing & Signal Timing Design.

4.5 Simulation and Results

Synchro 10 is the software chosen for the evaluation of our design. As shown in Table 5, LOS of eight signal-controlled intersections in 2039 meet the desired level C. Please check Appendix B to find out more details about LOS and signal timing calculations.

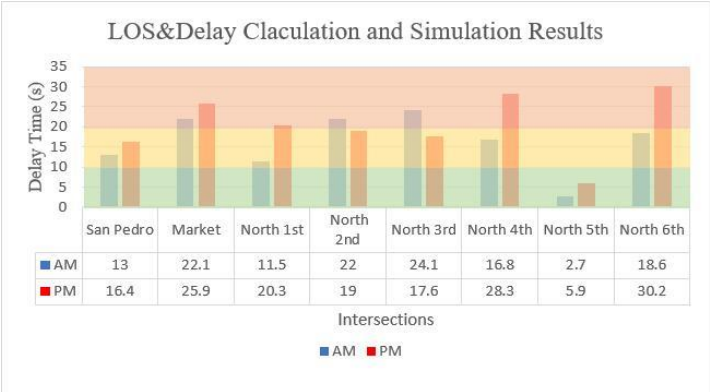


Figure 5. 2039 LOS & Delay Calculation and Simulation Results

5 Cost Estimation

The total cost of our project is about $0.9 million, where accident and labor cost are both estimated to be 25% of the construction cost and mobilization cost is about 10% of the construction cost. We decide to take this proportion by referring to some similar projects in the US. The amounts used and removed are obtained through measurements of length, width, depth and the unit price are obtained through the contract cost database on the website of the California Department of transportation. Then we multiply the unit cost by the quantity and sum every item up. In this way, estimated cost is calculated. It's necessary to note that this cost may fluctuate because of the labor cost and bad weather. More detailed information of the construction material can be found in the Appendix C.

Table 3. Cost Estimation

Table The probable cost	
Description	Total cost (USD)
Section 1-7:Street Construction	545,205.00
Mobilization	54,520.50
Contingency	136,301.25
Labor Cost	136,301.25
Grand Total	872,328.00

6 Benefits of the Design

6.1 Functionality

The design is to reconstruct Santa Clara Street to a street with two bus-bike shared lanes and two vehicle lanes from the intersection of the W Santa Clara Street and San Pedro Street

to the intersection of E Santa Clara Street and North 6th Street with the purpose of the providing higher traffic efficiency to the Santa Clara Street. Santa Clara Street is the city's main road and is an important transit hub for buses. The introduction of bus-bike shared lane and bus stop is very helpful for the traffic improvement in the area.

By incorporation this design, bus and bike can continuously drive on their own lanes without stopping, which also reduce the impact on other vehicles. Bus-bike shared lanes provide increased space and visibility for active street users while improving transit service reliability. Moreover, according to the data we got from the area, there is also a high demand of parking space along the street, and that is the reason why we decided to leave two parking lanes at each side of the street to accommodate the needs.

The vehicle will be using the middle two vehicle lanes, which will turn into three lanes at each intersection to accommodate the need of left (right) turn vehicles.

A two-way left turn lane allows vehicles to make left turns in both directions from the roadway. Two-way left turn lanes are designated by distinctive roadway markings consisting of parallel double yellow lines. The interior line is dashed and the exterior line is solid on each side of the lane. The alignment drawing of a two-way left turn lane is shown in Fig. 6 and we finish the drawing by taking a reference to *MUTCD*.

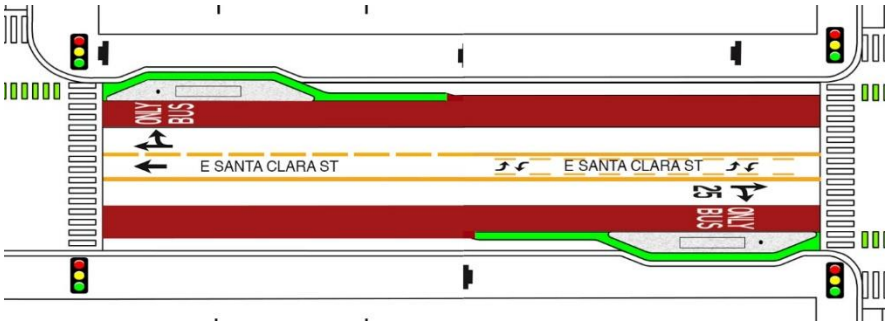


Fig 6. Special design of two-way left turn lane

6.2 Safety Evaluation

The design is aimed to create engineering improvements to increase the overall safety of the pedestrian. The safety of the passenger is highly considered and is the number one priority in this street design project. It is designed to avoid collision between pedestrians, motor vehicles, non-motorized vehicle, bus and bike. A separate lane for cyclists is given behind the bus stop to avoid the collision between the bus and bike as well as the congestion at the transit stop. A reasonable signal timing of intersection for each interaction is also to solve the problem of the crossing pedestrians.

Intersection signals are appropriately used to eliminate the collision between pedestrians, bus, bike and other vehicles to ensure the safety of pedestrians when they cross the street. The new speed control and school-related signages are also added to guarantee the safety of students within the school area are between the North 5th street and North 6th street.

Regarding the design's Right turn pocket, permits dedicated right-turn phases, potentially beneficial for pedestrian and bicyclist safety and operations at high-pedestrian intersections.

6.3 Impact Analysis

Bus-bike shared lanes are not usually a high comfort bike facility or a great substitute for dedicated bike lanes, especially during peak hours and on high volume bus routes._Special care must be taken which is not allowing bicycles and buses to mix at high speeds. With the increase of bus running speed and traffic volume, the number of overtaking events increases,

which affects the comfort of bicycle users and the safety of facilities. The reduction of vehicle lanes and the reduction of width could cause traffic congestion to a certain extent, affecting the speed of vehicles. And with the inclusion of right turn pocket, as usual, there will be a requirement of the removal of several parking spaces or other curbside uses and also lengthens the pedestrian crossing, which requires longer pedestrian clearance phases and could potentially delaying movement (including transit movement) on the cross street.

6.4 Innovation

We introduce the time-based signal timing design into the project. Different signal timing scheme is carried out at different times of the day. What's more, the signal timing scheme of this design considers the optimality of the entire road segment instead of a local intersection optimization.

The design also provides a short bike channel wrapping behind transit stops which can mitigate conflicts between transit vehicles and bicycles at bus stops and also decrease pedestrian-cyclist conflicts. The right-turn Pocket and the two-way left turn lanes are introduced in the area where necessary for improving the traffic efficiency.

6.5 Improvement

The newly introduced bike bus shared lane will able to solve the current problems of unorganized traffic between bus and bike. Changes to the street signage, adding speed controls and pavement marking alongside the street have also been made.

The intersection traffic situation has been significantly improved, and the LOS of all the intersections have met and exceeded the minimum standard requirement of the project. The intersections' signal timing and phasing of the design can reduce the average vehicle delay. This control scheme can also solve and prevent the contradiction between the light rail trains and the vehicles in the intersections of Santa Clara Street & North 1st Street and Santa Clara Street & North 2nd Street.

The design proposal will able to provides better overall safety for all pedestrians and travelers on the road.

7 Conclusion

This proposal will transform Santa Clara street to be a four-lane street, with two bus-bike shared lane, two vehicle lanes and with two other parking lanes. There will a new design at the bus top area with the introduction of the exclusive bike lane, and a new bus stop design.

The innovative signal timings and phasing design was also applied and LOS for each intersection has met the requirement of C. The total cost of this project is around 872 grands.

New traffics signage, pavement marking and speed control Clara street were also added to revamp the traffics efficiency and also providing better safety for all pedestrians and travelers.

8 Reference

[1] AASHTO (2011). A Policy on Geometric Design of Highways and Streets

[2] DOT, U. S. (2009). Manual on Uniform Traffic Control Devices (MUTCD). Federal Highway Administration, Washington, DC

[3] San Jose City Council (2018) San Jose Completes Streets Design Standards and Guidelines

[4] DOT, U. S. (2008). Traffic Signal Timing Manual. Federal Highway Administration, Washington, DC

[5] Bureau of Local Road and Streets Manual AND (2006), Sight Distance

[6] Caltrans (2006) Highway Design Manual- Sixth Edition

[7] TRB (2010). Highway Capacity Manual 2010. Transportation Research Board, National Research Council, Washington, DC

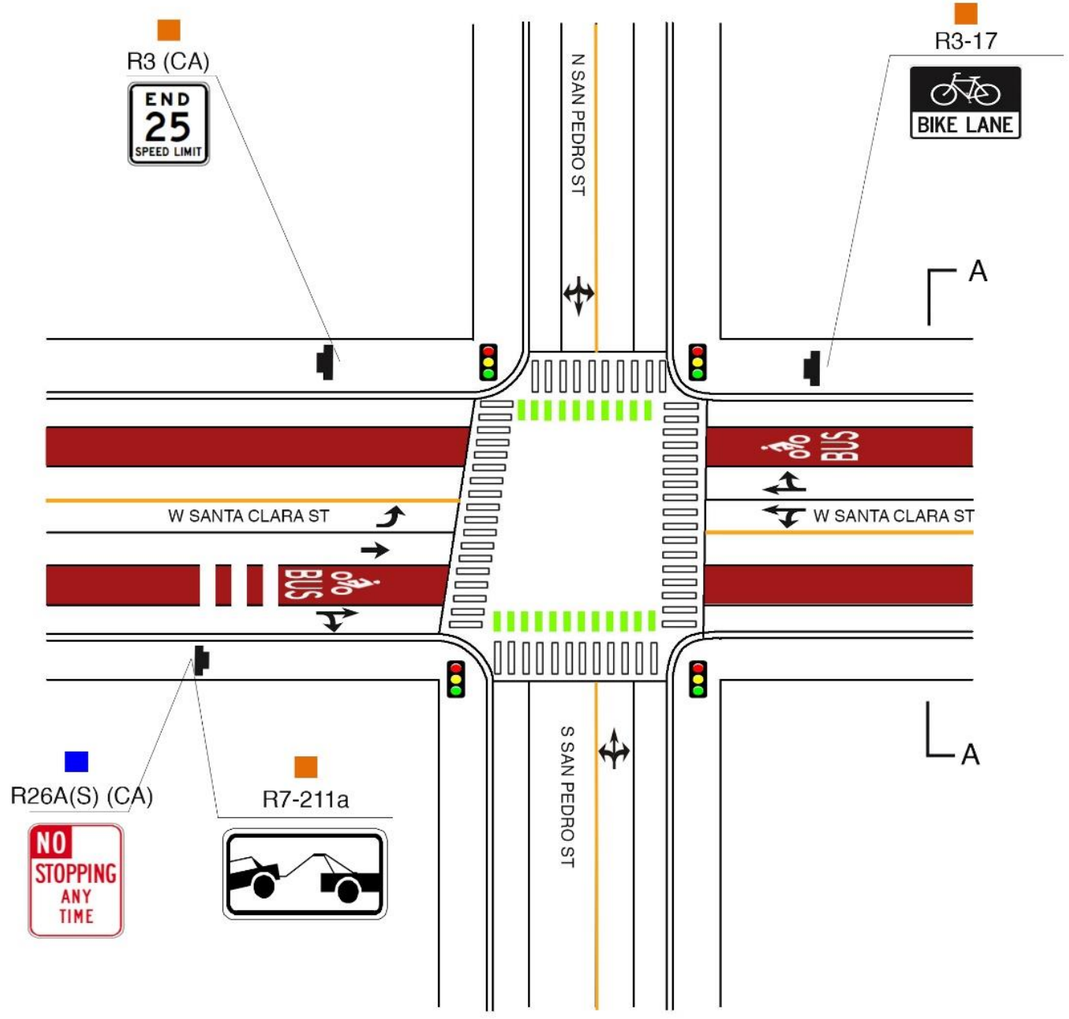
9 Abbreviation

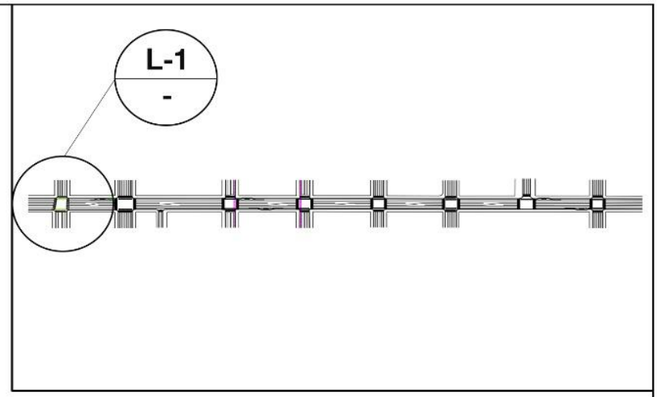
AADT.	Annual Average Daily Traffic
AASHTO.	American Association of State Highway and Transportation Officials.
CALTRANS.	California Department of Transportation
FG.	Finish Grade
HCM.	Highway Capacity Manual
HDM.	Highway Design Manual
HMA.	Hot Mix Asphalt
ISD.	Intersection Sight Distance
LOS.	Level of Service
MUTCD.	Manual on Uniform Traffic Control Devices
NACTO	National Association of City Transportation Official
OG.	Original Ground
TCM.	Traffic Control Manual

Appendix

Appendix A: Plan Sheets

INDEX OF PLAN SHEETS	
SHEET NUMBER AND NAME	SHEET TITLE
L-1 to L-8	LAYOUTS
P-1 to P-7	ROADWAYS PROFLIES
TS-1 to TS-4	TYPICAL SECTION
BS-1	BUS STOP
C-1	CURB RAMP
DS-1 to DS-3	DETAIL SHEETS
TV-1 to TV-8	INTERSECTION TRAFFIC VOLUME
ST-1 to ST-16	SIGHT TRIANGLE





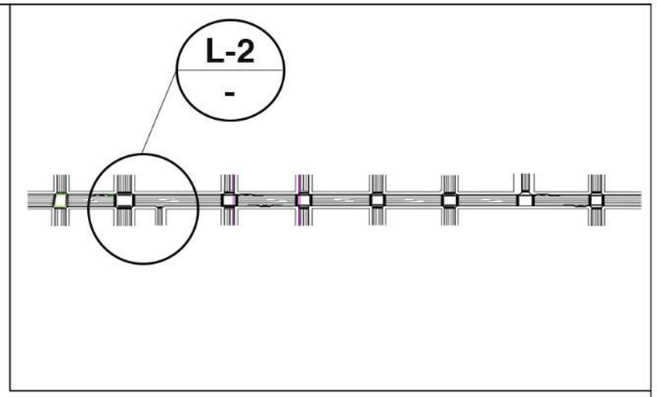
LEGEND

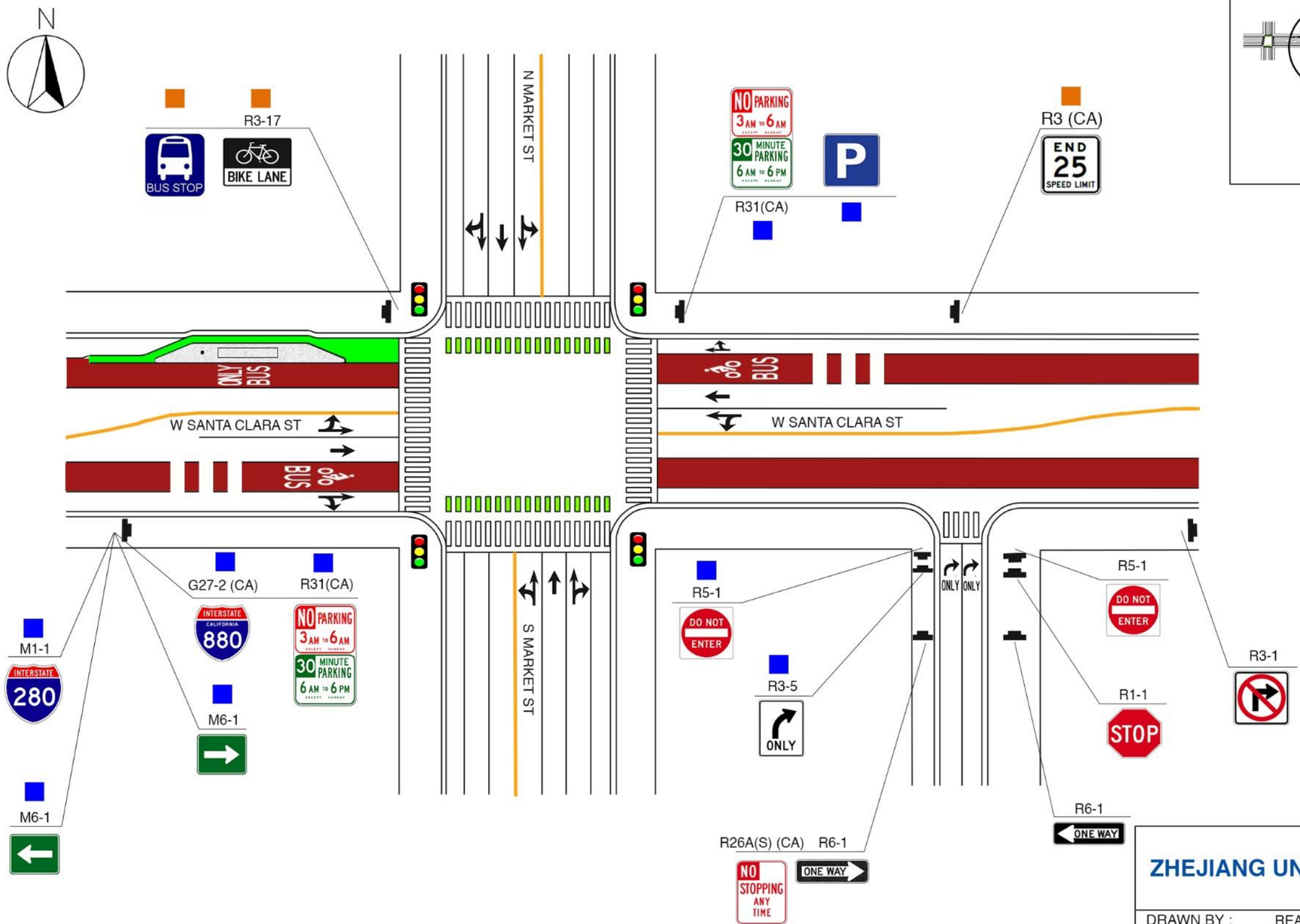
- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

NOTES:
1.THIS LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

ZHEJIANG UNIVERSITY			L-1
DRAWN BY :	MAOSI GENG	LAYOUT	SHEET 1 OF 48
CHECKED BY :	REACHSAK LY		
DATE :	28/2/2019		
SCALE :	1"=50'		

NOTES:
1.THIS LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

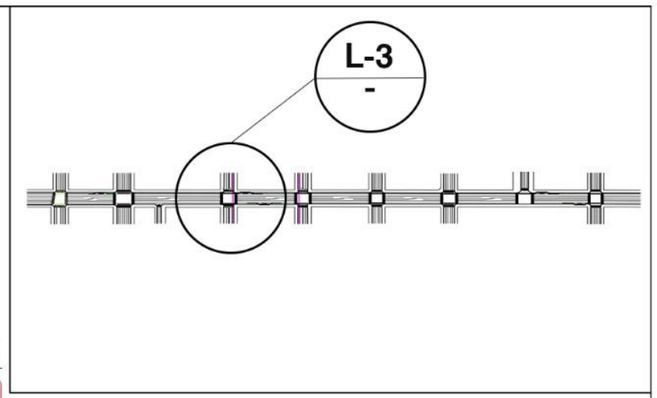


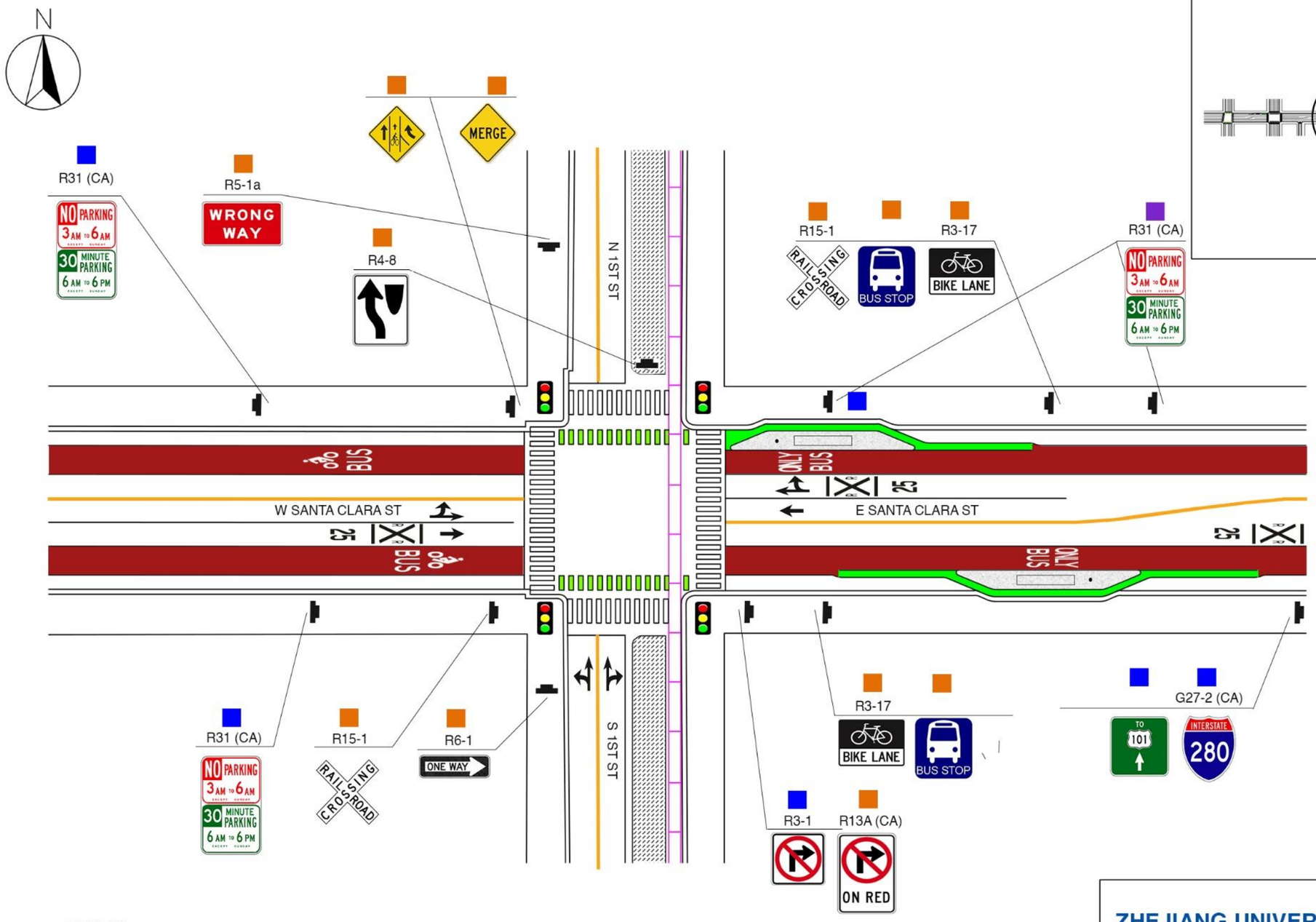


LEGEND

- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

ZHEJIANG UNIVERSITY			L-2
DRAWN BY :	REACHSAK LY	LAYOUT	SHEET 2 OF 48
CHECKED BY :	MAOSI GENG		
DATE :	28/2/2019		
SCALE :	1"=50'		



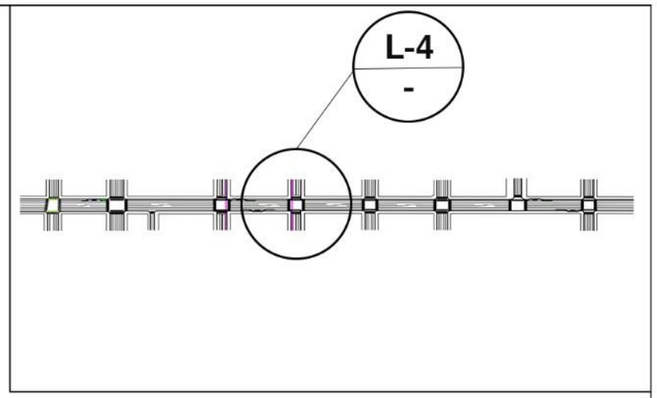


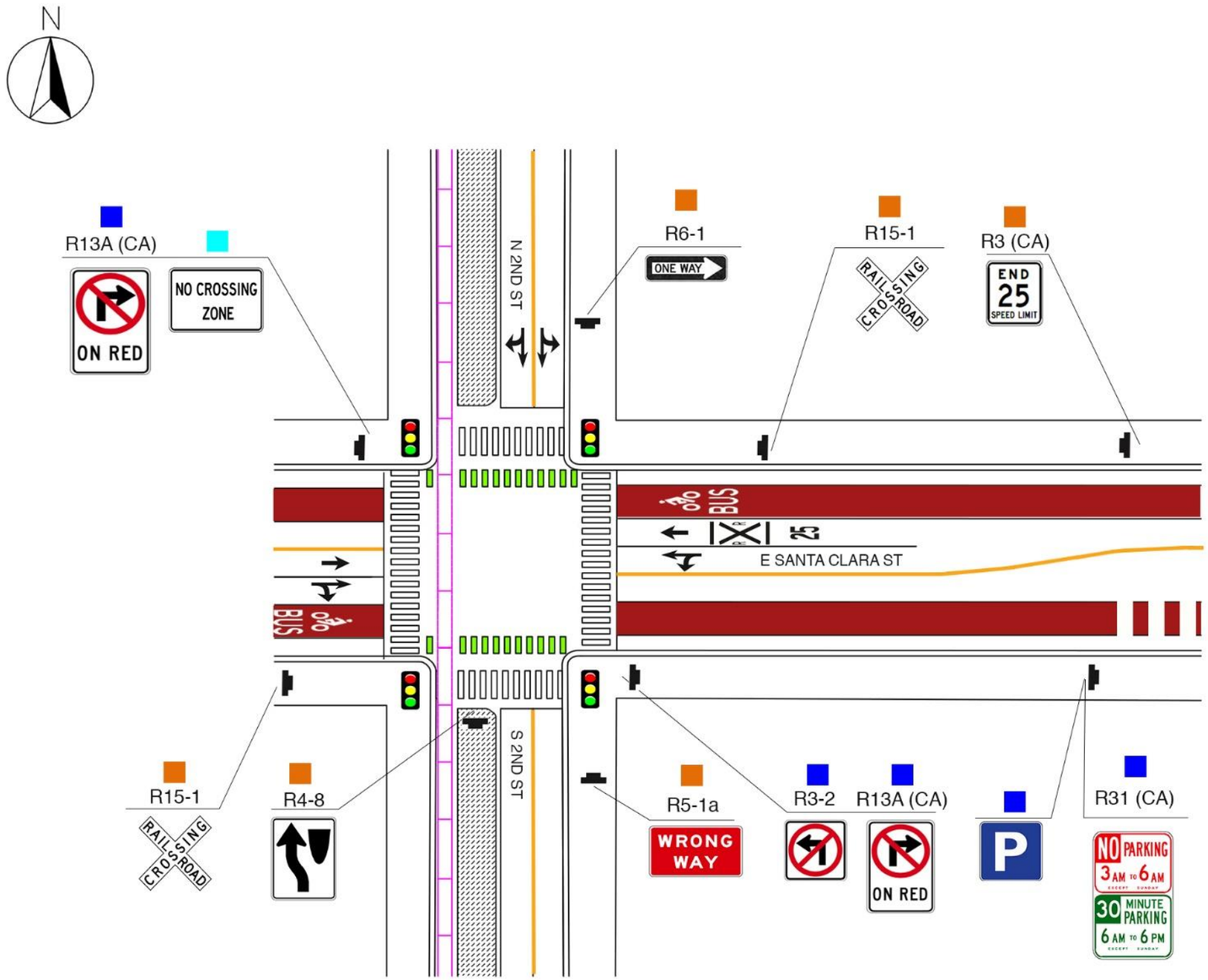
LEGEND

- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

NOTES:
1.THE LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

ZHEJIANG UNIVERSITY		L-3
DRAWN BY :	REACHSAK LY	LAYOUT
CHECKED BY :	MAOSI GENG	
DATE :	28/2/2019	
SCALE :	1"=50'	



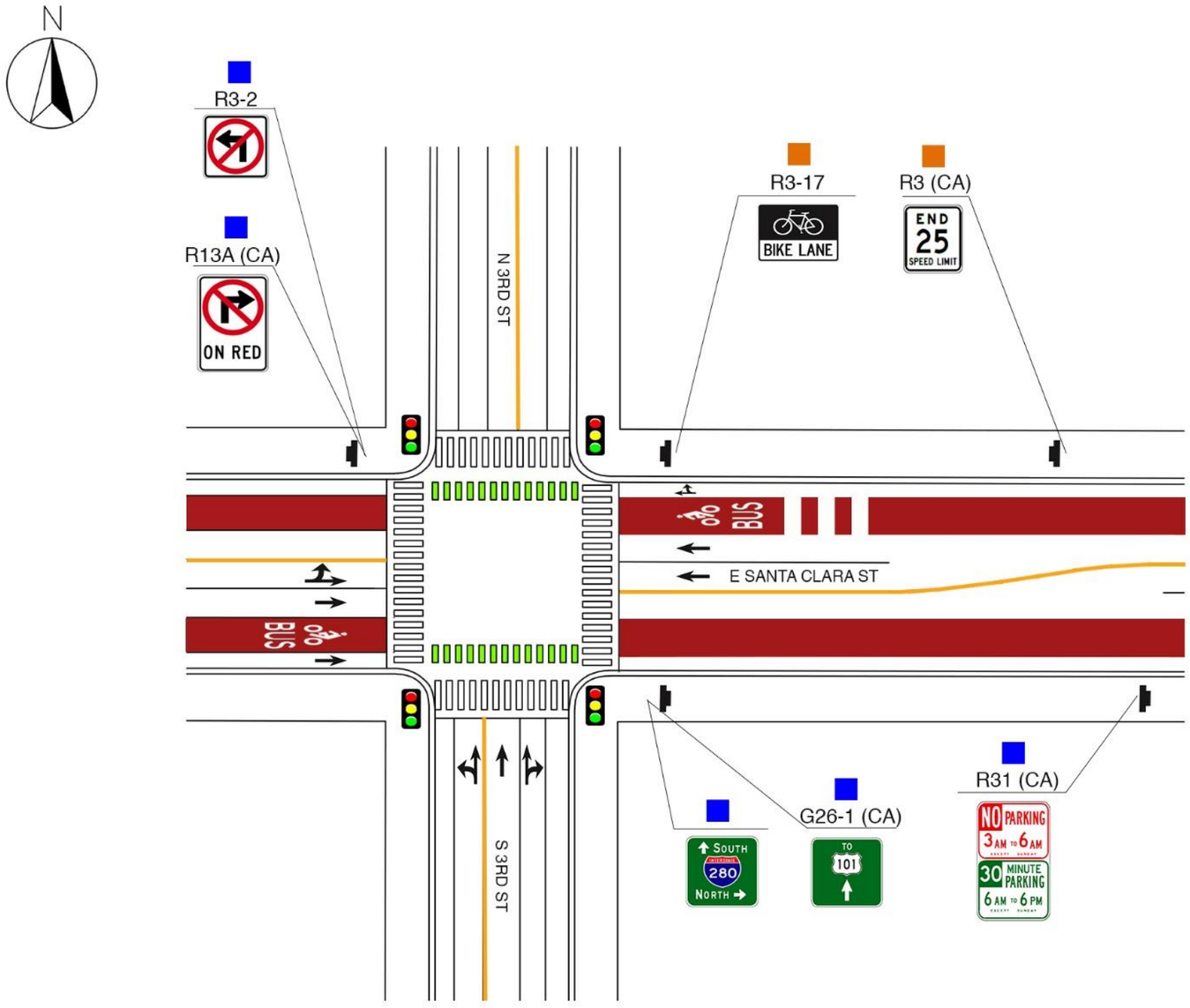


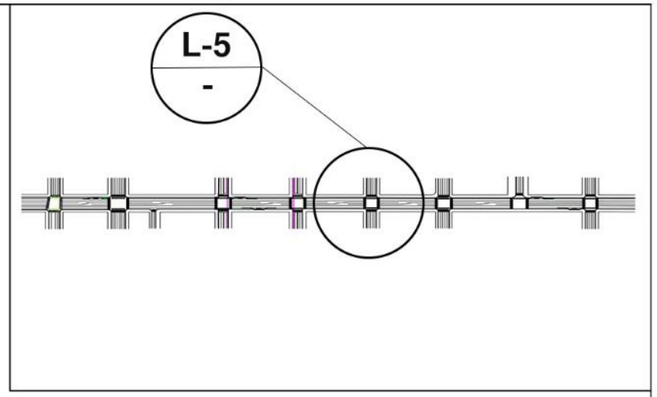
LEGEND

- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

NOTES:
1.THIS LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

ZHEJIANG UNIVERSITY			L-4
DRAWN BY :	REACHSAK LY	LAYOUT	SHEET 4 OF 48
CHECKED BY :	MAOSI GENG		
DATE :	28/2/2019		
SCALE :	1"=50'		



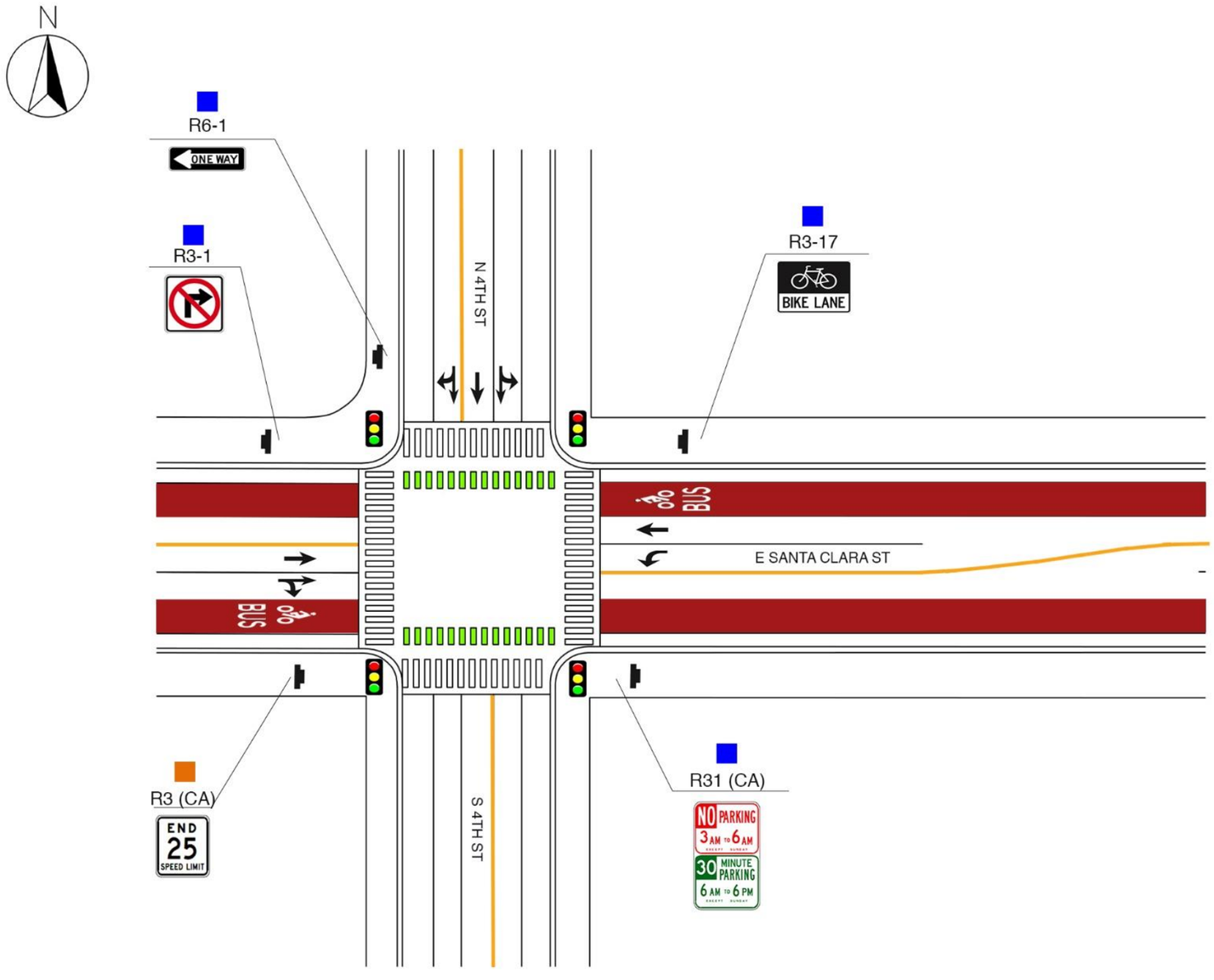


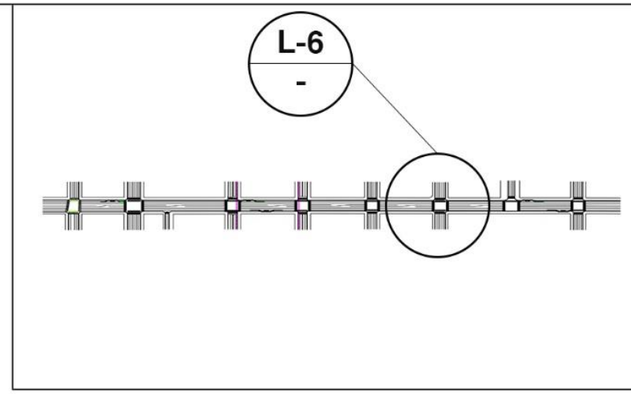
LEGEND

- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

NOTES:
1.THIS LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

ZHEJIANG UNIVERSITY		L-5
DRAWN BY :	REACHSAK LY	LAYOUT
CHECKED BY :	MAOSI GENG	SHEET 5 OF 48
DATE :	28/2/2019	
SCALE :	1"=50'	



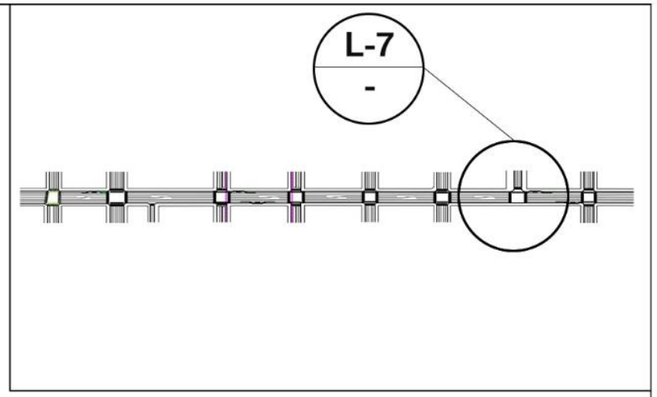


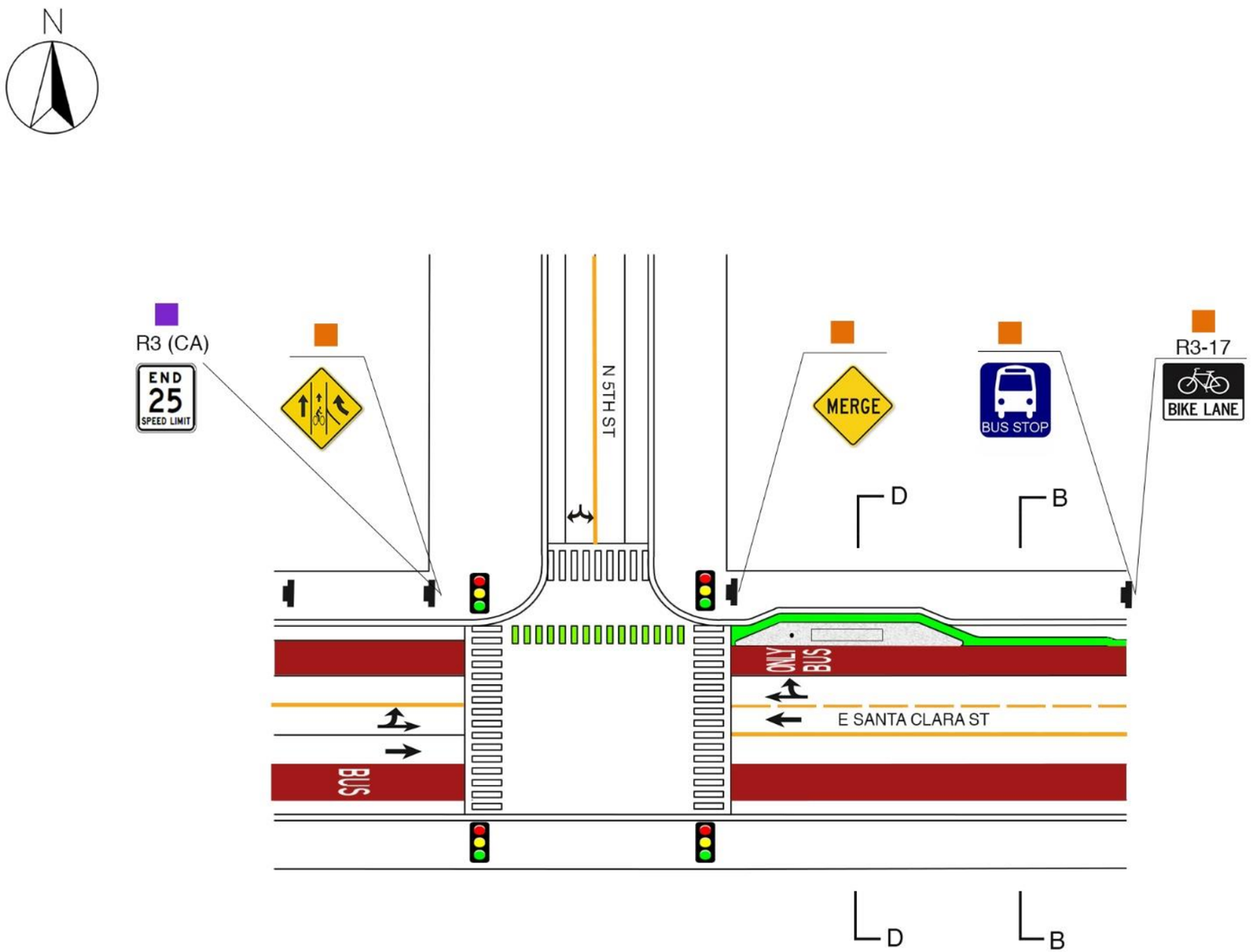
LEGEND

- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

NOTES:
1.THIS LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

ZHEJIANG UNIVERSITY			L-6
DRAWN BY :	MAOSI GENG	LAYOUT	SHEET 6 OF 48
CHECKED BY :	REACHSAK LY		
DATE :	28/2/2019		
SCALE :	1"=50'		



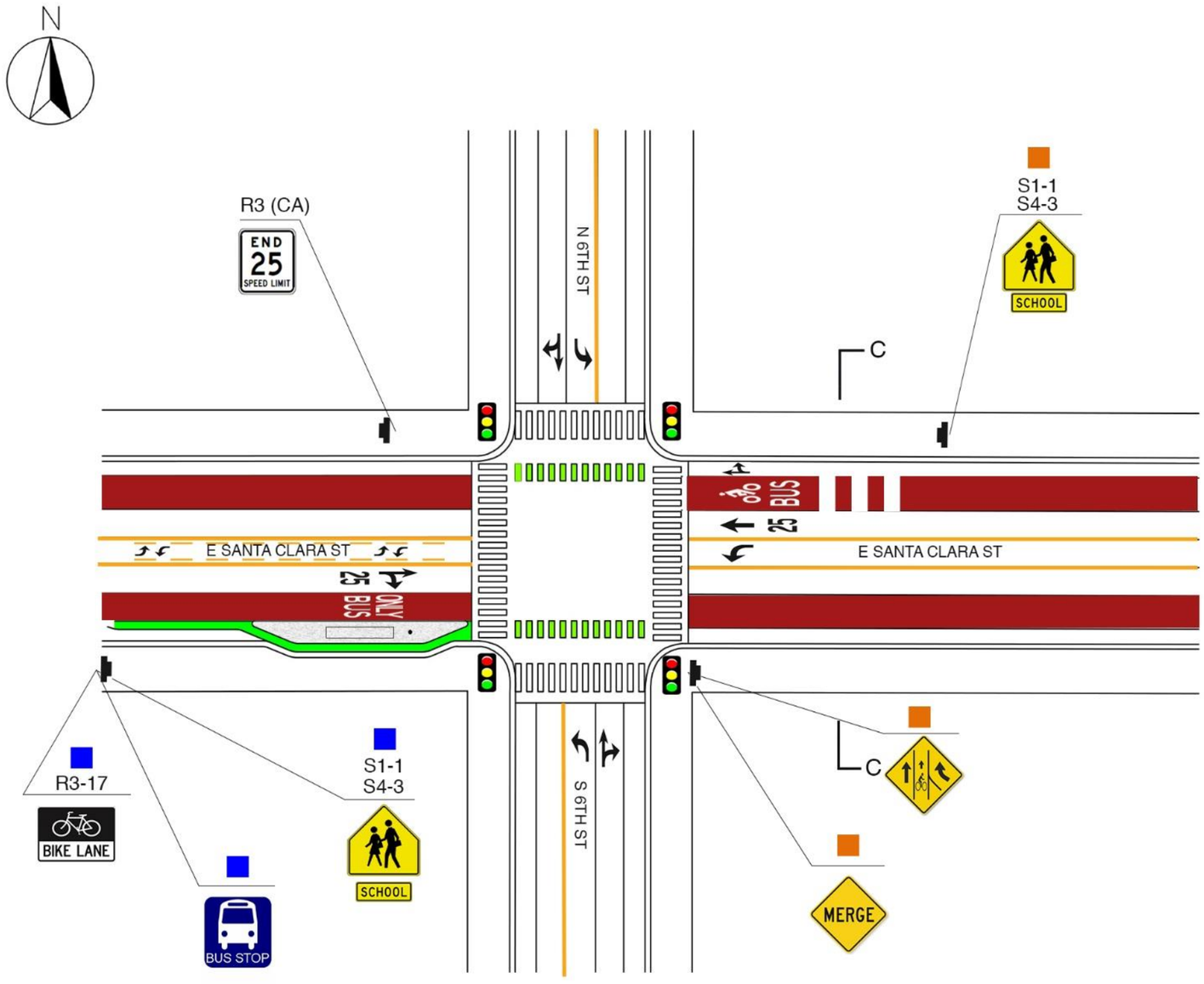


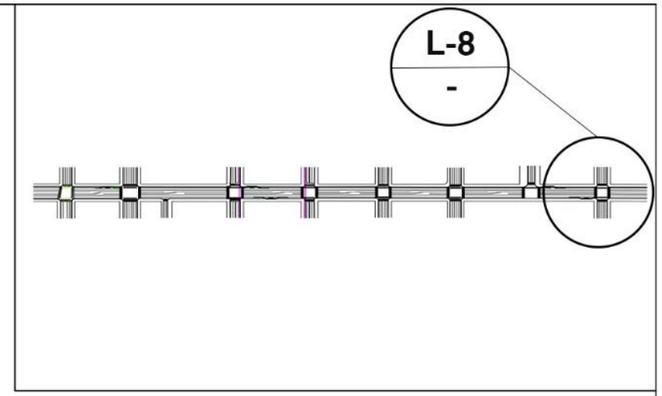
LEGEND

- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

NOTES:
1.THIS LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

ZHEJIANG UNIVERSITY		L-7	
DRAWN BY :	MAOSI GENG	LAYOUT	SHEET OF
CHECKED BY :	REACHSAK LY		
DATE :	28/2/2019		
SCALE :	1"=50'		



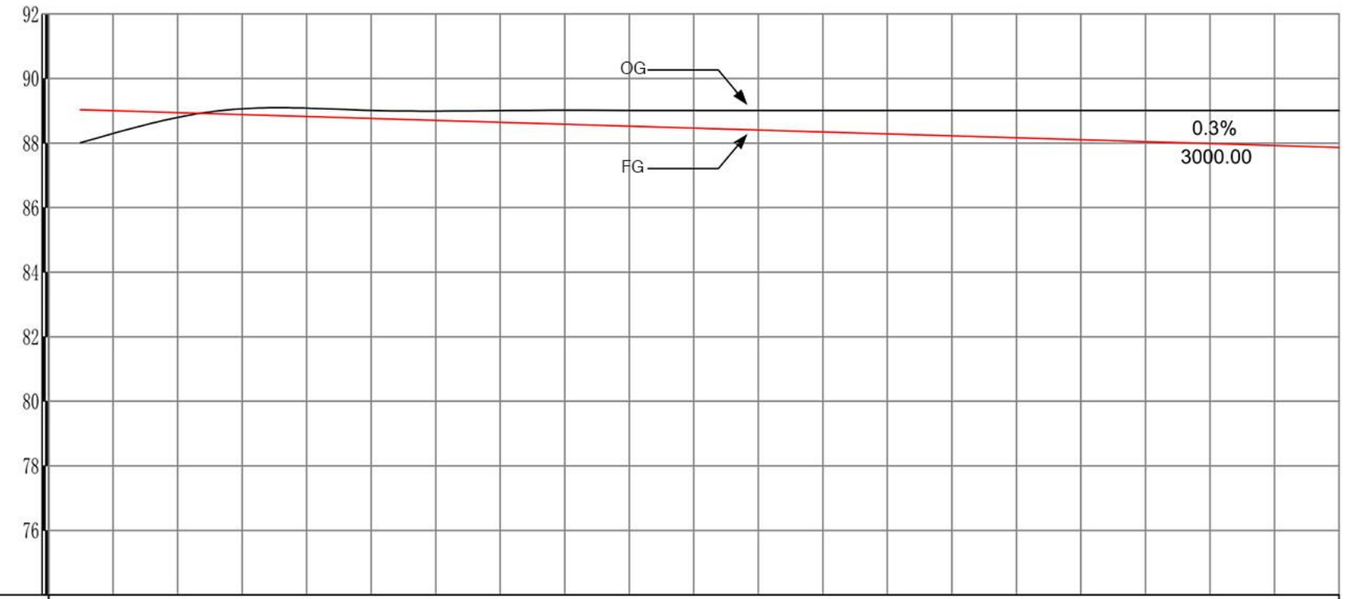


LEGEND

- EXISTING SIGN
- SIGN RELOCATE
- SIGN REMOVE
- SIGN INSTALL
- BIKE LANE
- BUS BIKE SHARED LANE
- RAILROAD
- MEDIAN
- BUS STOP

NOTES:
1.THIS LAYOUT PLAN IS ONLY A SCHEMATIC DRAWING. FOR ROAD PAVEMENT MARKING DETAILS PLEASE REFER TO THE APPENDIX FOE DETAILS SHEET.
2.ALL DESIGNS ARE COMPLETED IN ACCORDANCE WITH THE CAMUTCD STANDARD.

ZHEJIANG UNIVERSITY		L-8
DRAWN BY :	MAOSI GENG	LAYOUT
CHECKED BY :	REACHSAK LY	SHEET OF
DATE :	28/2/2018	
SCALE :	1"=50'	



SCALE :
HORIZE : 1" = 50'
SCALE : 1" = 5'

GRADE(%)/SLOPE LENGHT	0.3% 3000.00								
DESIGN LEVEL (ft)	89.00	88.85	88.70	88.55	88.40	88.25	88.10	87.95	87.80
GROUND LEVEL	88.00	89.00	89.00	89.00	89.00	89.00	89.00	89.00	89.00
STAKE NUMBER	128+00		129+00		130+00		131+00		132+00
SRAIGHT AND CURVE									

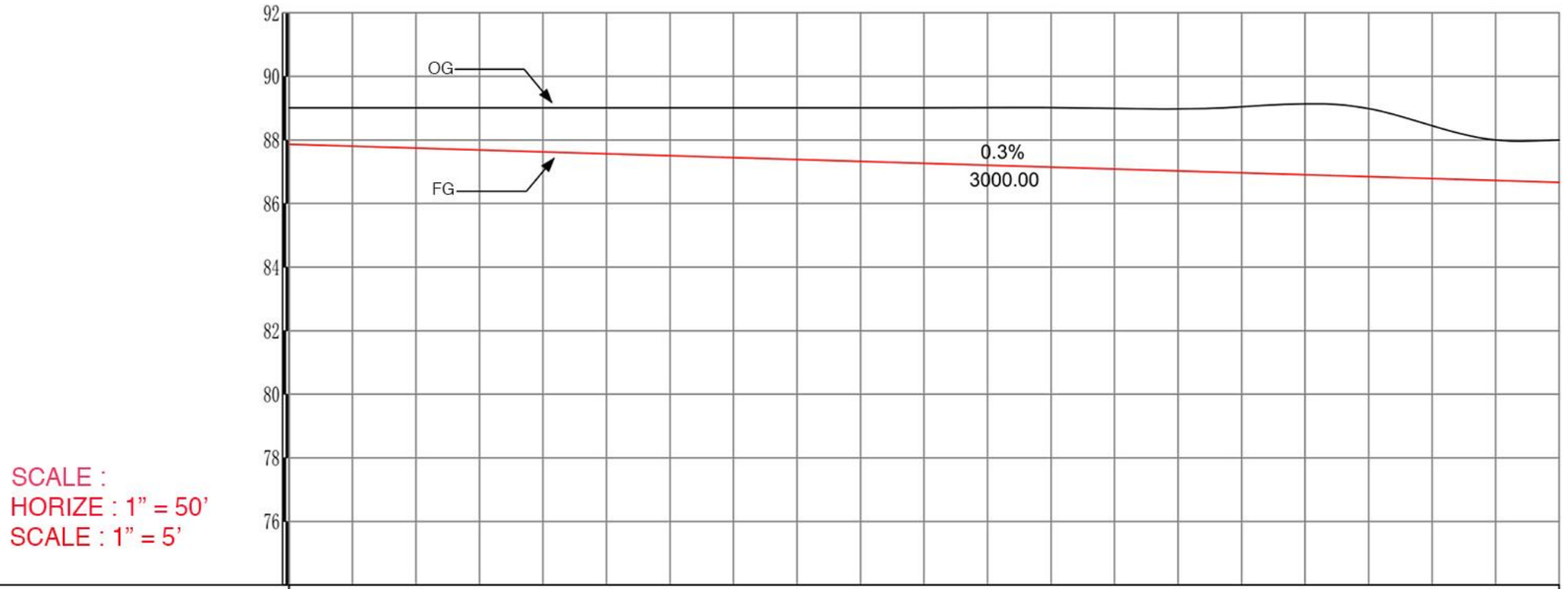
ZHEJIANG UNIVERSITY

P-1

DRAWN BY:	LOUTAO SHEN
CHECKED BY:	REACHSAK LY
DATE:	03/03/2019
SCALE:	AS SHOWN

PROFILES

SHEET 9 OF 48



SCALE :
HORIZE : 1" = 50'
SCALE : 1" = 5'

GRADE(%)/SLOPE LENGHT	0.3% 3000.00								
DESIGN LEVEL (ft)	87.65	87.50	87.35	87.20	87.05	86.90	86.75	86.60	86.45
GROUND LEVEL	89.00	89.00	89.00	89.00	89.00	89.00	89.00	89.00	88.00
STAKE NUMBER		133+00		134+00		135+00		136+00	
SRAIGHT AND CURVE									

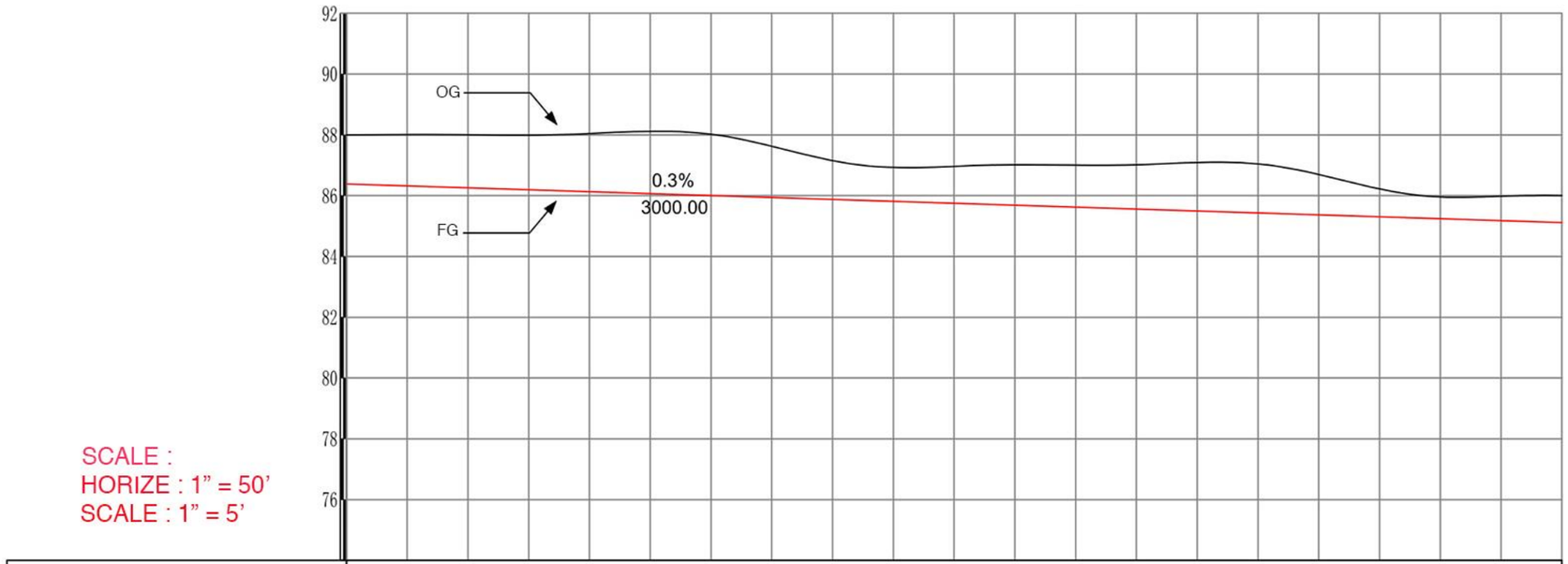
ZHEJIANG UNIVERSITY

P-2

DRAWN BY:	LOUTAO SHEN
CHECKED BY:	REACHSAK LY
DATE:	03/03/2019
SCALE:	AS SHOWN

PROFILES

SHEET 10 OF 48



SCALE :
HORIZE : 1" = 50'
SCALE : 1" = 5'

GRADE(%)/SLOPE LENGHT	0.3% 3000.00								
DESIGN LEVEL (ft)	86.30	86.15	86.00	85.85	85.70	85.55	85.40	85.25	85.10
GROUND LEVEL	88.00	88.00	88.00	87.00	87.00	87.00	87.00	86.00	86.00
STAKE NUMBER	137+00		138+00		139+00		140+00		141+00
SRAIGHT AND CURVE									

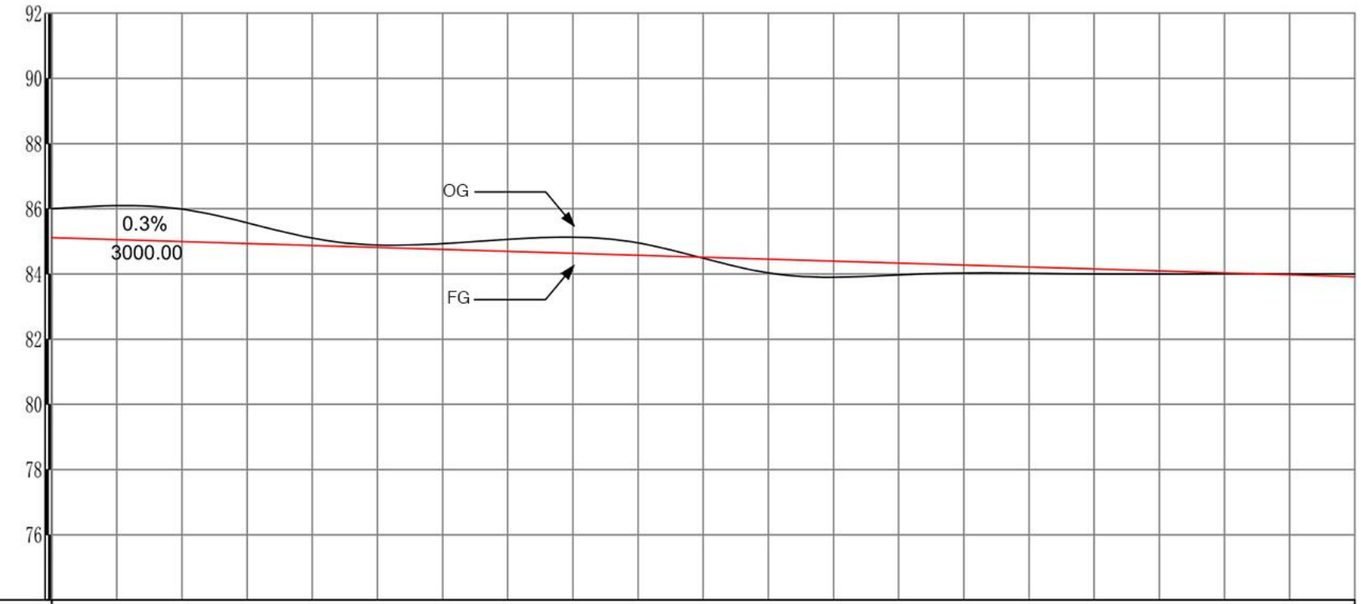
ZHEJIANG UNIVERSITY

P-3

DRAWN BY:	LOUTAO SHEN
CHECKED BY:	REACHSAK LY
DATE:	03/03/2019
SCALE:	AS SHOWN

PROFILES

SHEET 11 OF 48



SCALE :
HORIZE : 1” = 50’
SCALE : 1” = 5’

GRADE(%)/SLOPE LENGHT	0.3% 3000.00							
DESIGN LEVEL (ft)	84.95	84.80	84.65	84.50	84.35	84.20	84.05	83.90
GROUND LEVEL	86.00	85.00	85.00	85.00	84.00	84.00	84.00	84.00
STAKE NUMBER		142+00		143+00		144+00		145+00
SRAIGHT AND CURVE								

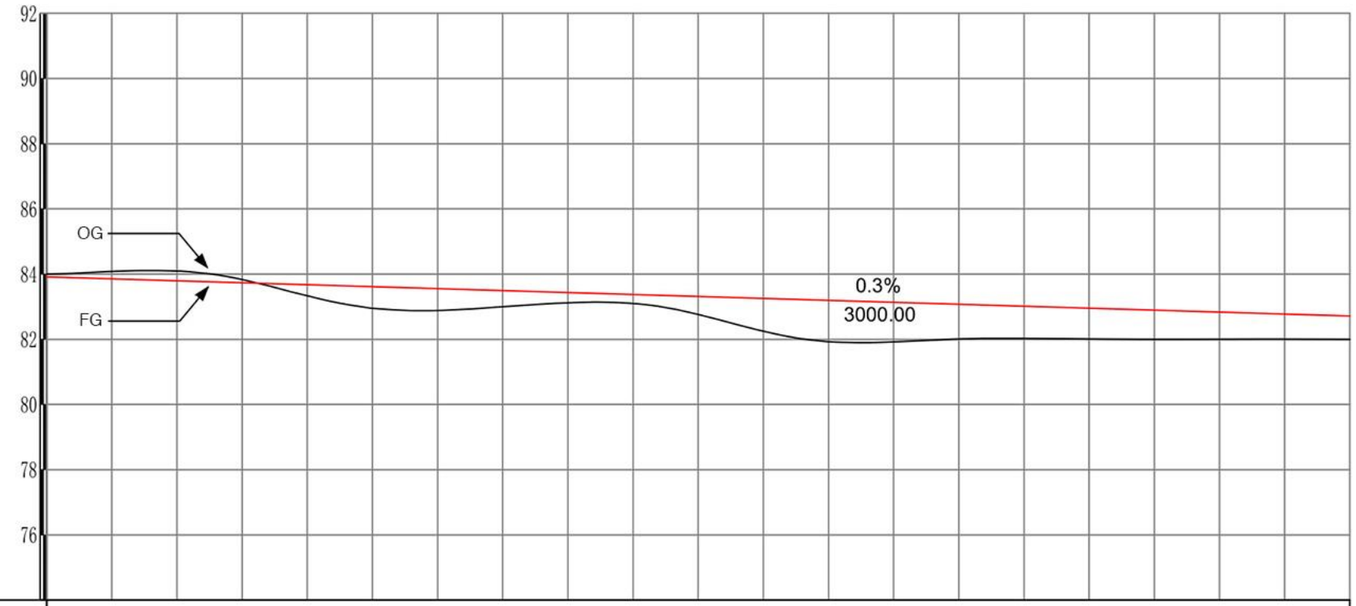
ZHEJIANG UNIVERSITY

P-4

DRAWN BY:	LOUTAO SHEN
CHECKED BY:	REACHSAK LY
DATE:	03/03/2019
SCALE:	AS SHOWN

PROFILES

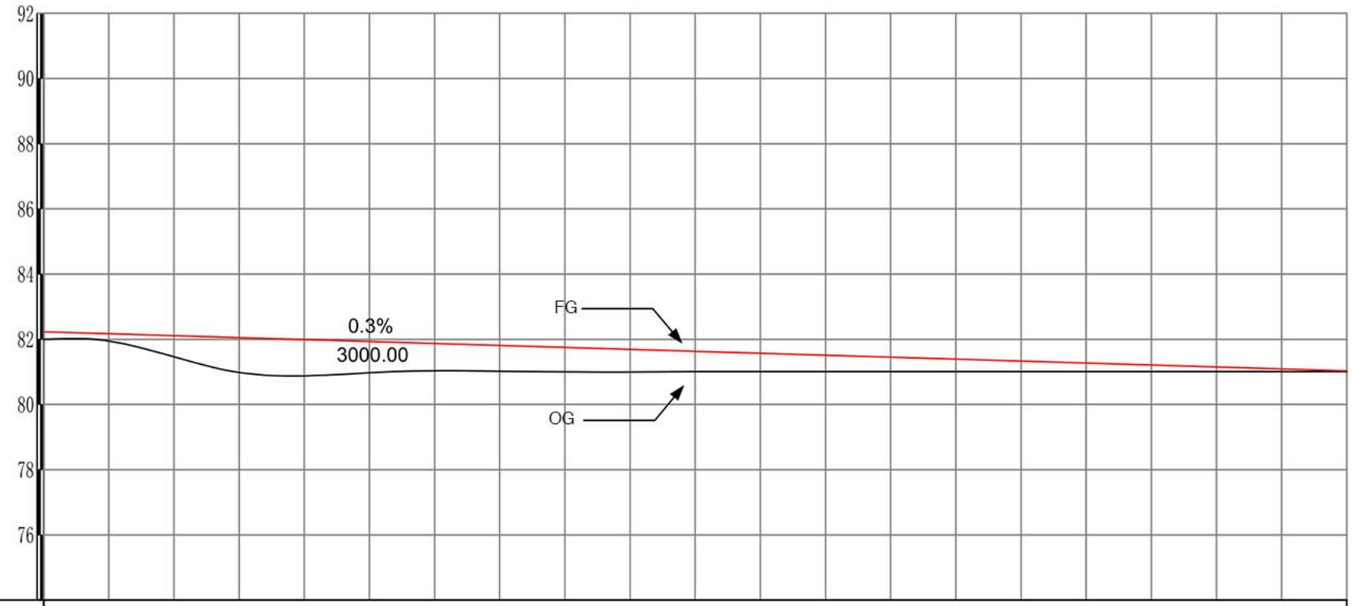
SHEET 12 OF 48



SCALE :
HORIZE : 1” = 50’
SCALE : 1” = 5’

GRADE(%)/SLOPE LENGHT	0.3% 3000.00								
DESIGN LEVEL (ft)	83.75	83.60	83.45	83.30	83.15	83.00	82.85	82.70	82.55
GROUND LEVEL	84.00	84.00	83.00	83.00	83.00	82.00	82.00	82.00	82.00
STAKE NUMBER		146+00		147+00		148+00		149+00	
SRAIGHT AND CURVE									

ZHEJIANG UNIVERSITY		**P-5**
DRAWN BY:	LOUTAO SHEN	**PROFILES**
CHECKED BY:	REACHSAK LY	SHEET 13 OF 48
DATE:	03/03/2019	
SCALE:	AS SHOWN	



SCALE :
HORIZE : 1" = 50'
SCALE : 1" = 5'

GRADE(%)/SLOPE LENGHT	0.3% 3000.00								
DESIGN LEVEL (ft)	82.40	82.25	82.10	81.95	81.80	81.65	81.50	81.35	81.20
GROUND LEVEL	82.00	81.00	81.00	81.00	81.00	81.00	81.00	81.00	81.00
STAKE NUMBER	150+00		151+00		152+00		153+00		154+00
SRAIGHT AND CURVE									

ZHEJIANG UNIVERSITY

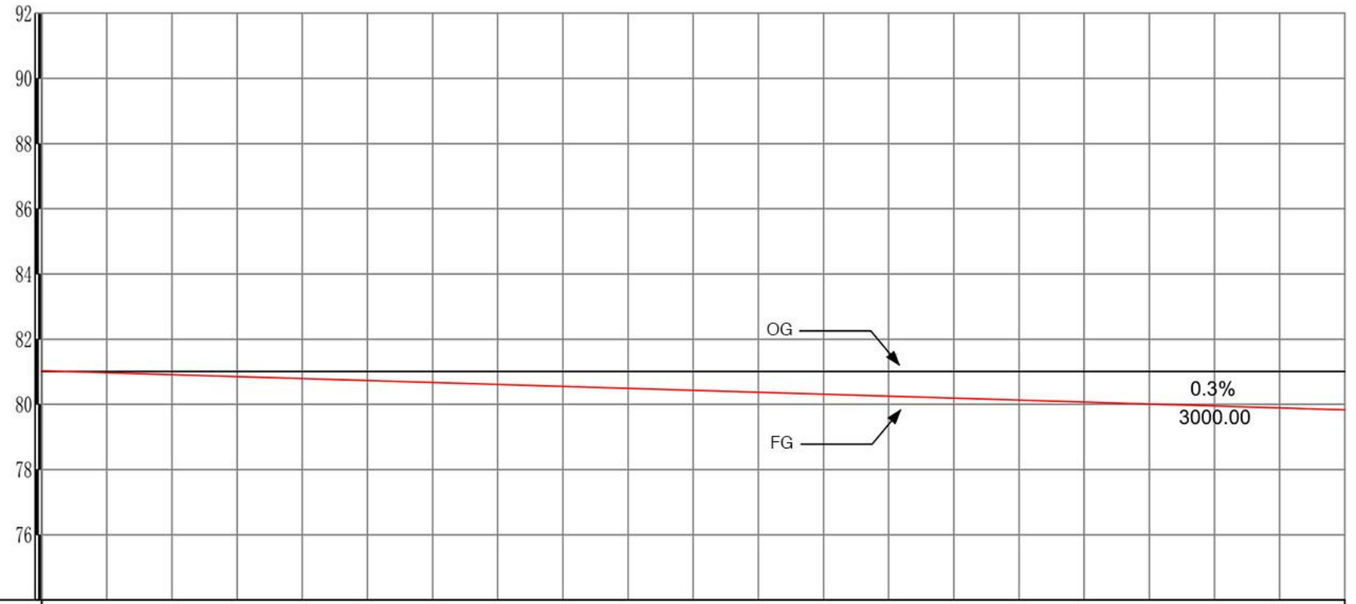
P-6

DRAWN BY:	LOUTAO SHEN
CHECKED BY:	REACHSAK LY
DATE:	03/03/2019
SCALE:	AS SHOWN

PROFILES

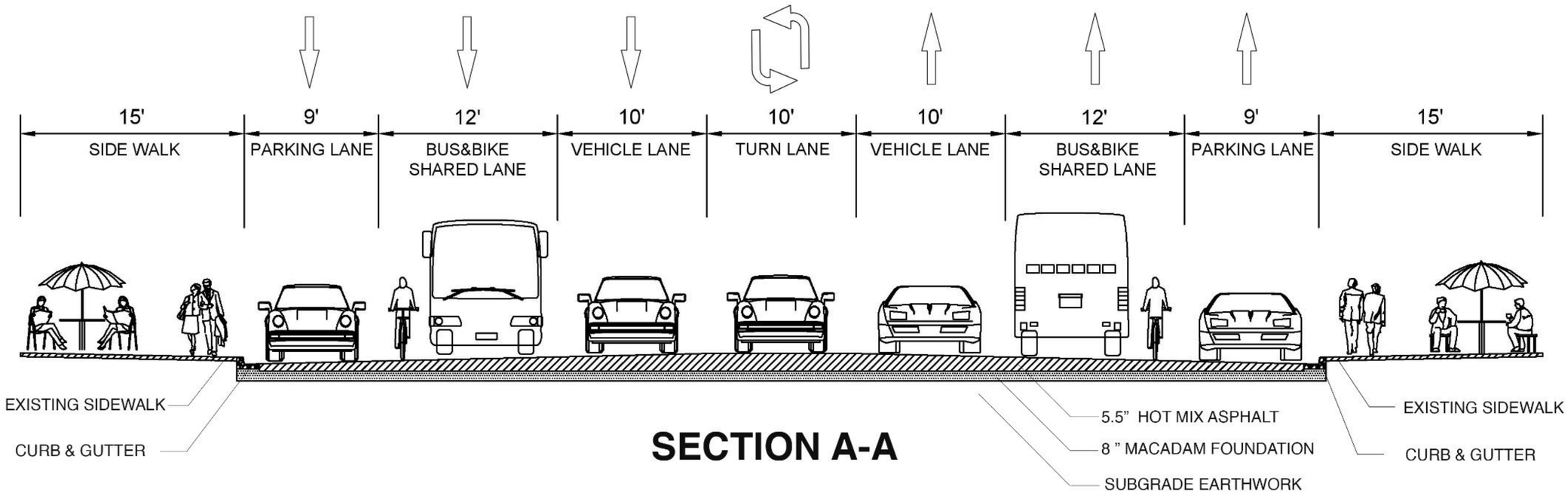
SHEET 14 OF 48

SCALE :
HORIZE : 1" = 50'
SCALE : 1" = 5'



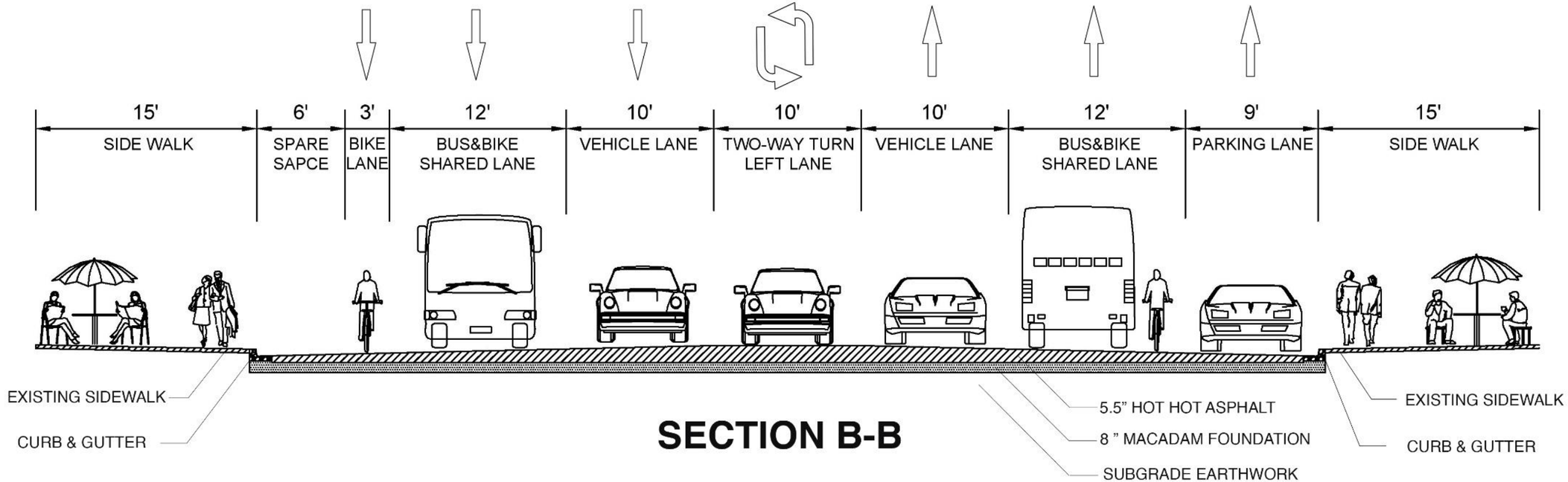
GRADE(%)/SLOPE LENGHT	0.3% 3000.00							
DESIGN LEVEL (ft)	81.05	80.90	80.75	80.60	80.45	80.30	80.15	80.00
GROUND LEVEL	81.00	81.00	81.00	81.00	81.00	81.00	81.00	81.00
STAKE NUMBER		155+00		156+00		157+00		158+00
SRAIGHT AND CURVE								

ZHEJIANG UNIVERSITY			P-7
DRAWN BY:	LOUTAO SHEN	PROFILES	SHEET 15 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	03/03/2019		
SCALE:	AS SHOWN		



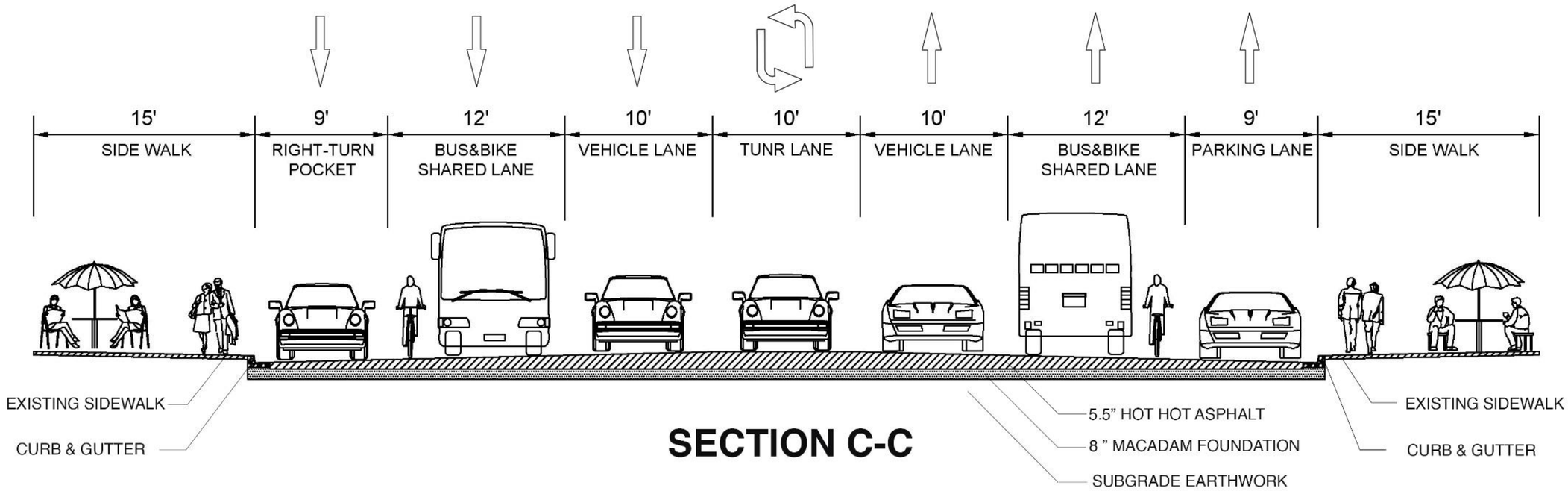
SECTION A-A

ZHEJIANG UNIVERSITY			**TS-1**
DRAWN BY:	YUANSHENG YU	**TYPICAL SECTIONS**	SHEET 16 OF 48
CHECKED BY:	REAHSAK LY		
DATE:	04/03/2019		
SCALE:	1"=8'		



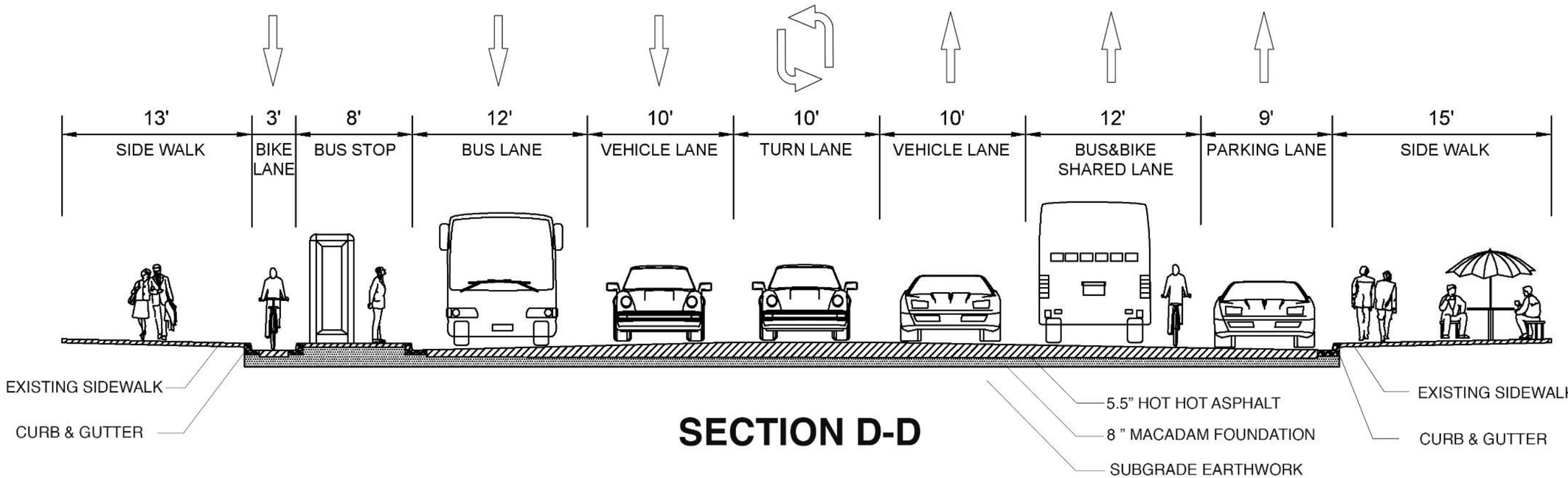
SECTION B-B

ZHEJIANG UNIVERSITY			TS-2
DRAWN BY:	YUANSHENG YU	TYPICAL SECTIONS	SHEET 17 OF 48
CHECKED BY:	REAHSAK LY		
DATE:	04/03/2019		
SCALE:	1"=8'		



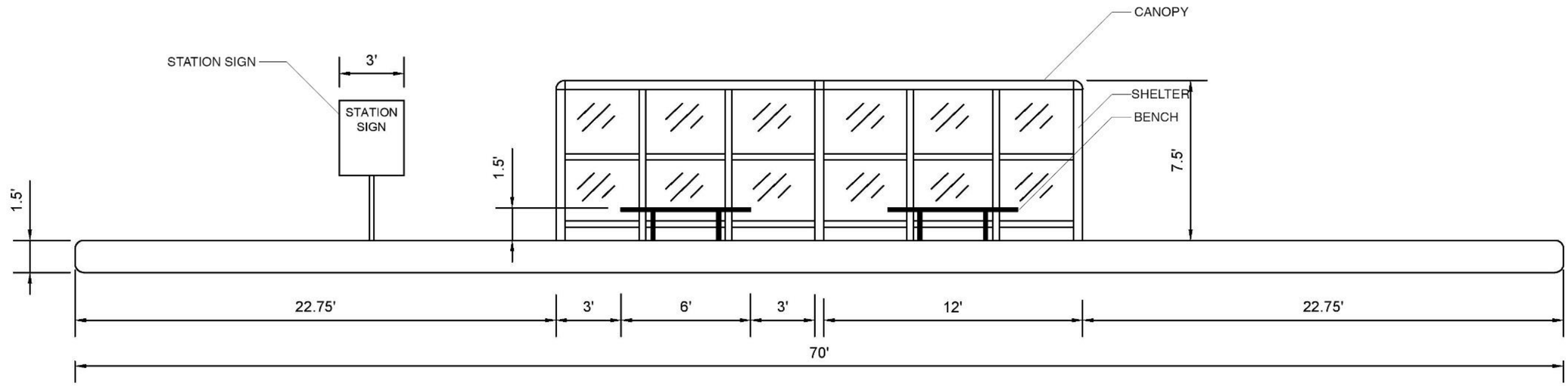
SECTION C-C

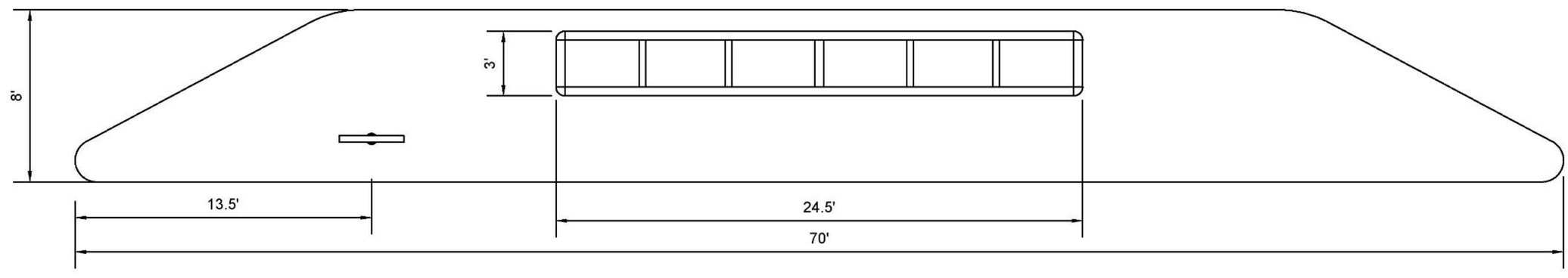
ZHEJIANG UNIVERSITY			TS-3
DRAWN BY:	YUANSHENG YU	TYPICAL SECTIONS	SHEET 18 OF 48
CHECKED BY:	REAHSAK LY		
DATE:	04/03/2019		
SCALE:	1"=8'		



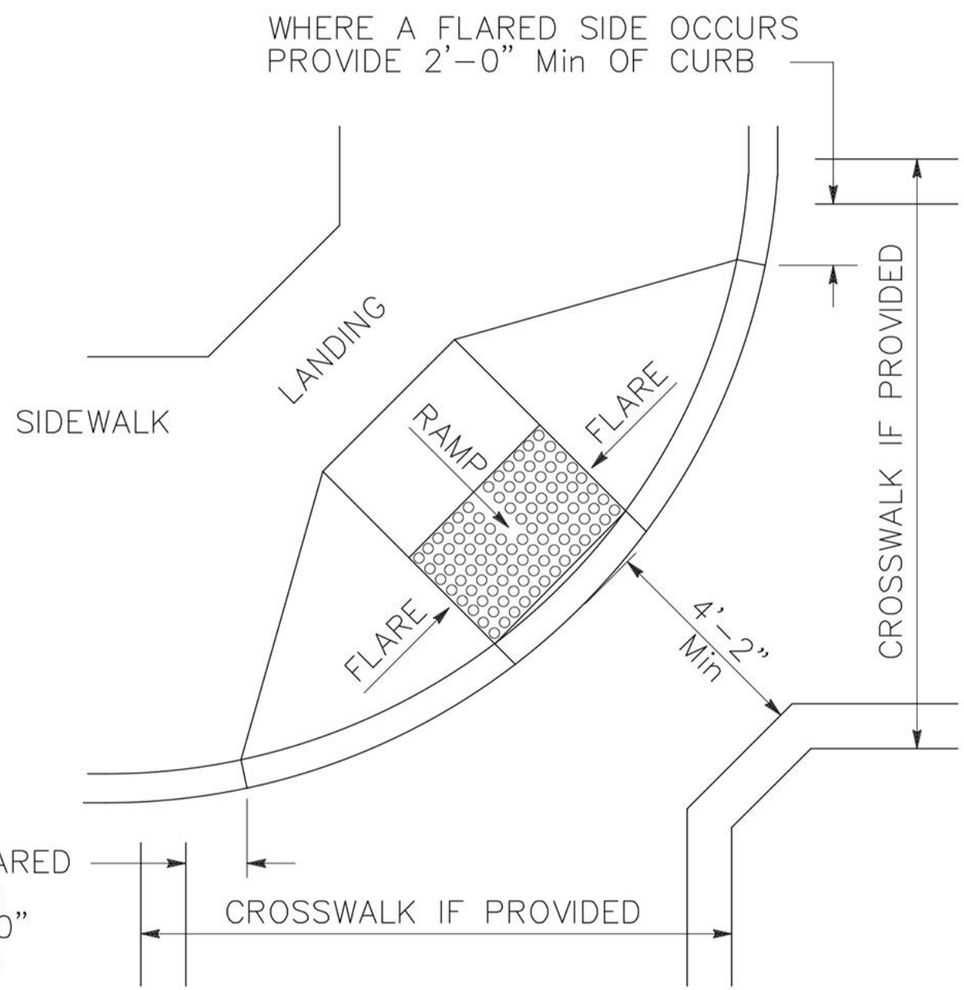
SECTION D-D

ZHEJIANG UNIVERSITY			TS-4
DRAWN BY:	YUANSHENG YU	TYPICAL SECTIONS	SHEET 19 OF 48
CHECKED BY:	REAHSAK LY		
DATE:	04/03/2019		
SCALE:	1"=8'		

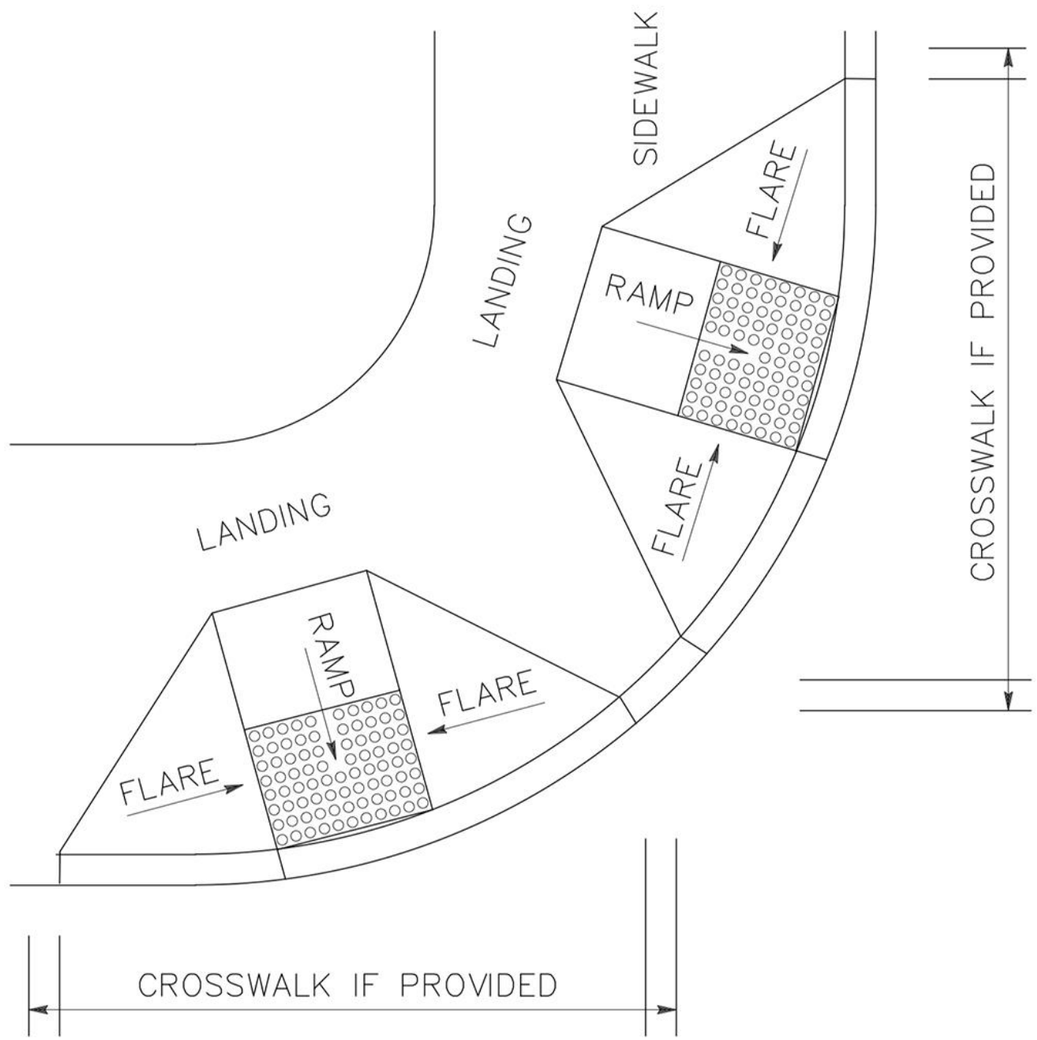




ZHEJIANG UNIVERSITY			**BS-1**
DRAWN BY:	YUANSHENG YU	**BUS STOP**	SHEET 20 OF 48
CHECKED BY:	LOUTAO SHEN		
DATE:	04/03/2019		
SCALE:	1"= 5'		



TYPYCAL ONE-RAMP INSTALLATION

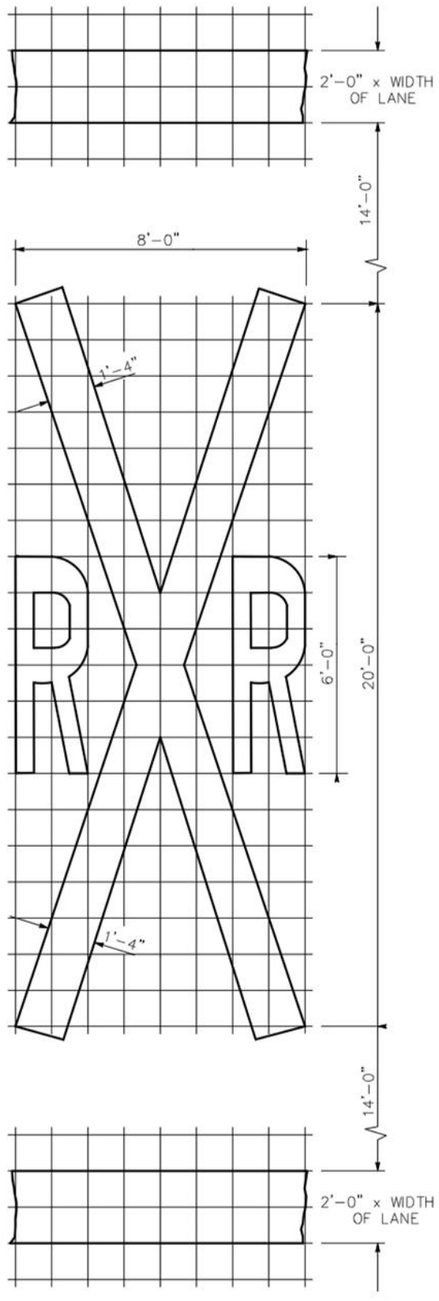


TYPYCAL TWO-RAMP INSTALLATION

ZHEJIANG UNIVERSITY			**C-1**
DRAWN BY:	REAHSAK LY	**CURB RAMP DETAILS**	SHEET 21 OF 48
CHECKED BY:	YUANSHENG YU		
DATE:	12/03/2019		
SCALE:	NO SCALE		

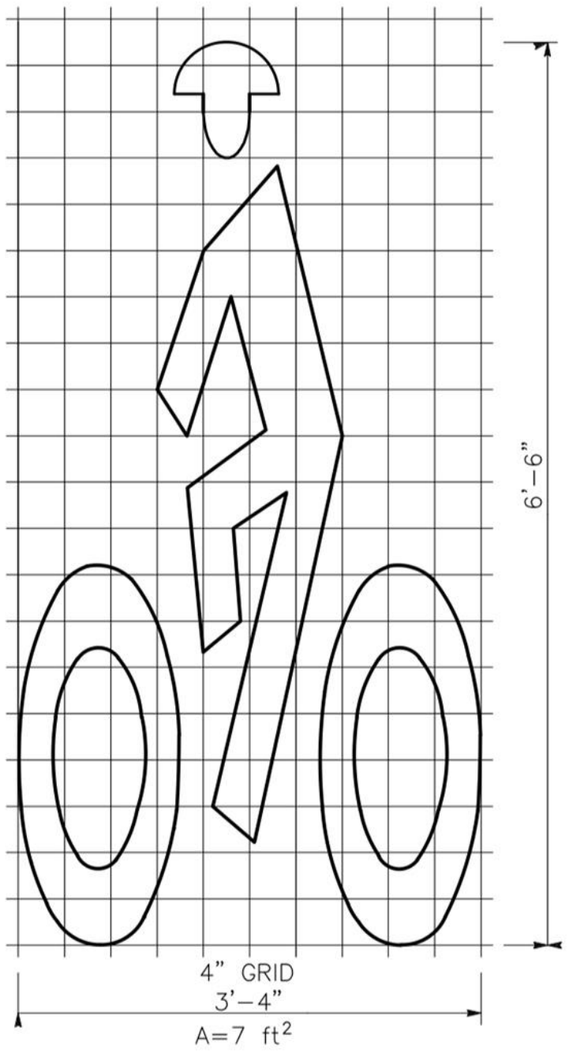
PAVEMENT MARKINGS SYMBOL AND NUMERALS

DETAIL 1



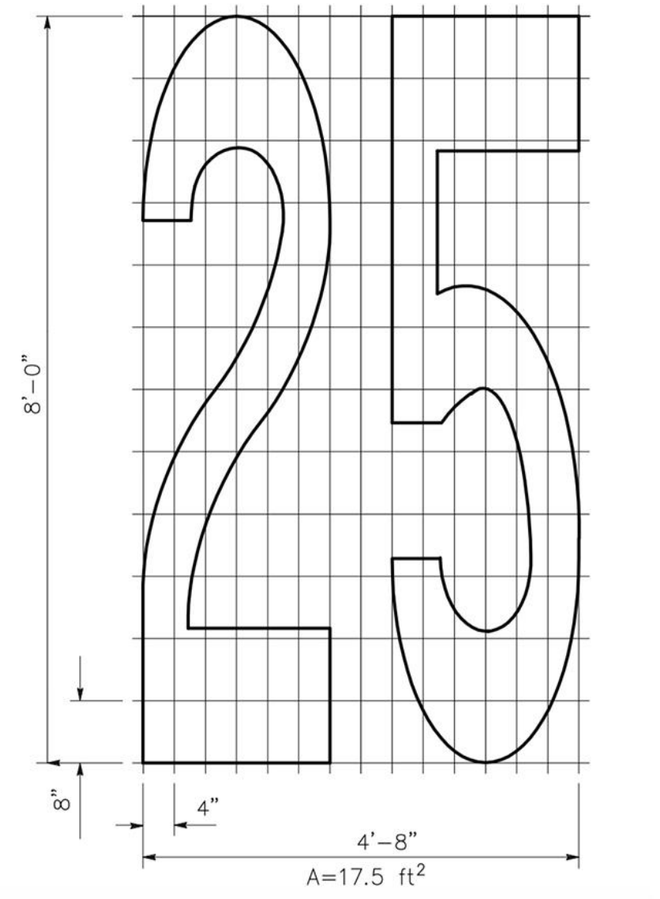
RAILROAD CROSSING SYMBOL

DETAIL 2



BIKE LANE SYMBOL
WITH PERSON

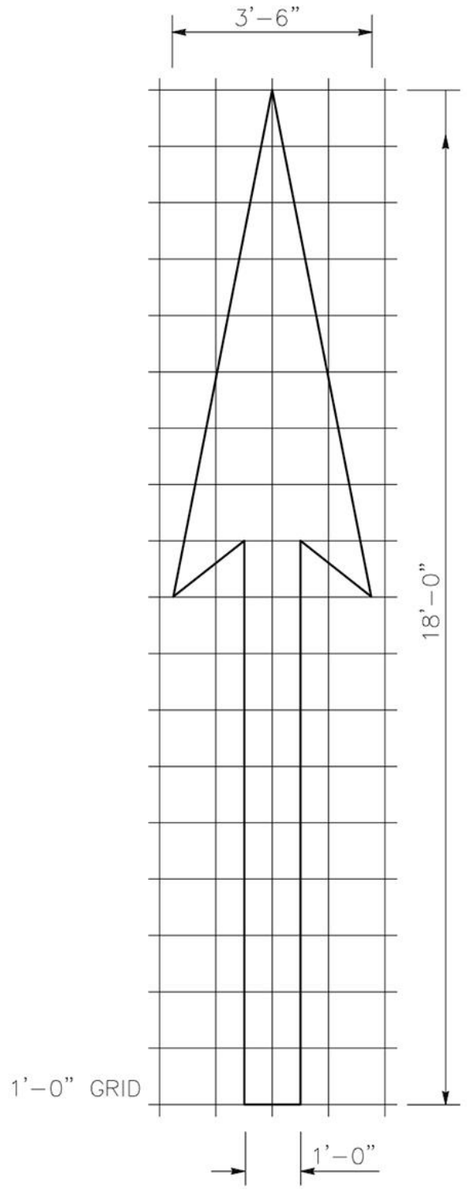
DETAIL 3



NUMERALS

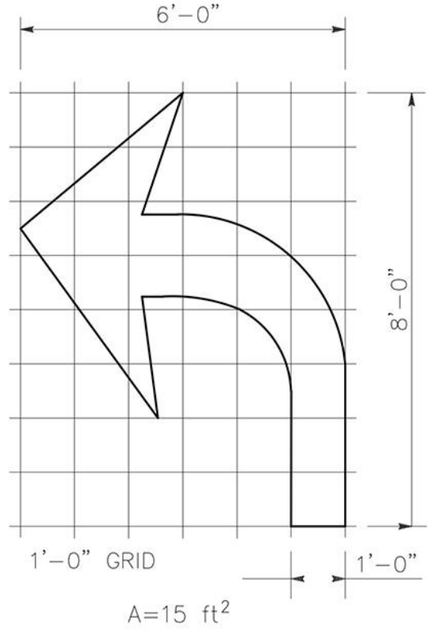
ZHEJIANG UNIVERSITY			**D-1**
DRAWN BY:	REAHSAK LY	**DETAIL SHEETS**	SHEET 22 OF 48
CHECKED BY:	YUANSHENG YU		
DATE:	12/03/2019		
SCALE:	NO SCALE		

DETAIL 1



TYPE I ARROW

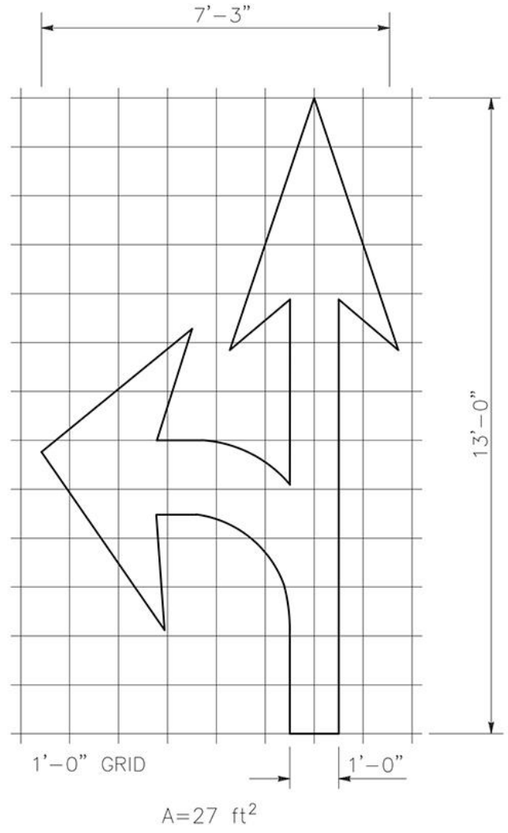
DETAIL 2



TYPE II (L) ARROW

FOR TYPE II (R) ARROW,
USE MIRROR IMAGE

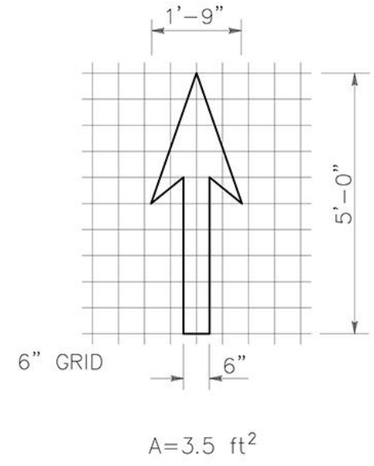
DETAIL 3



TYPE III (L) ARROW

FOR TYPE III (R) ARROW,
USE MIRROR IMAGE

DETAIL 4

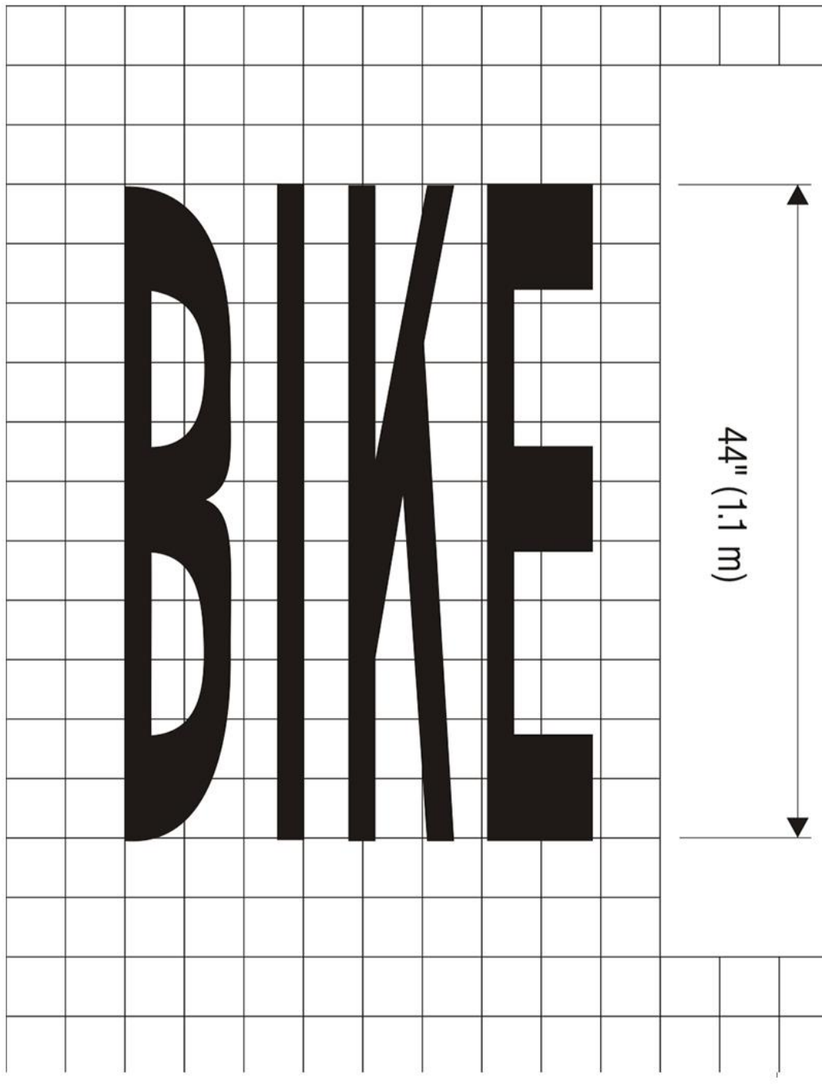


BIKE LANE ARROW

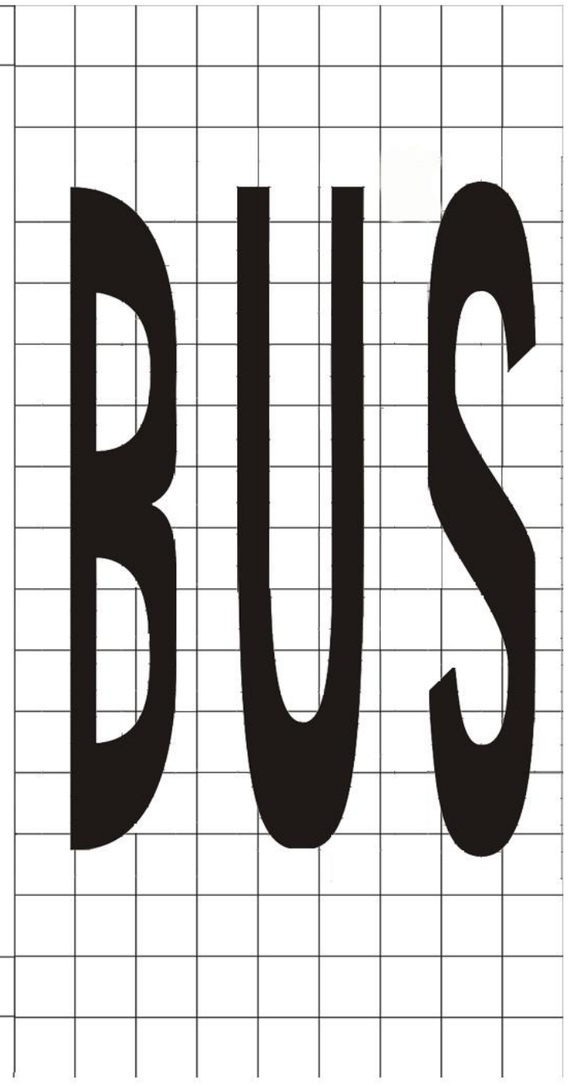
PAVEMENT MARKINGS
ARROWS

ZHEJIANG UNIVERSITY	D-2
DRAWN BY: REAHSAK LY	DETAIL SHEETS
CHECKED BY: YUANSHENG YU	SHEET 23 OF 48
DATE: 12/03/2019	
SCALE: NO SCALE	

DETAIL 1



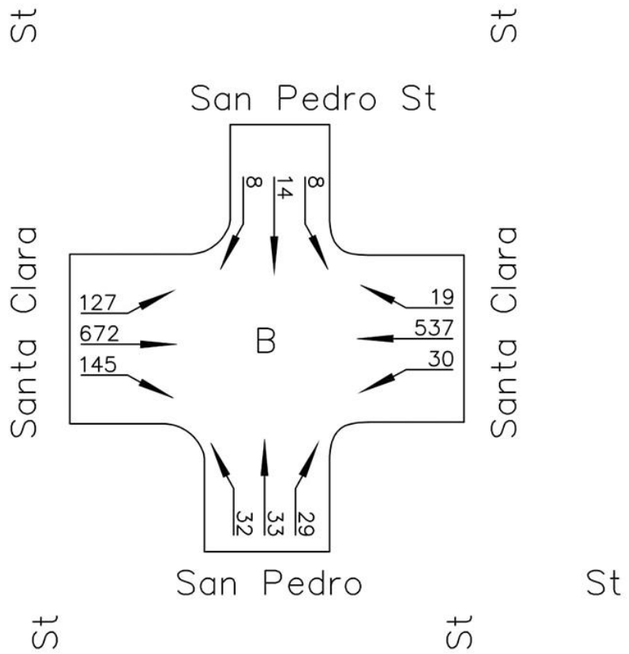
DETAIL 2

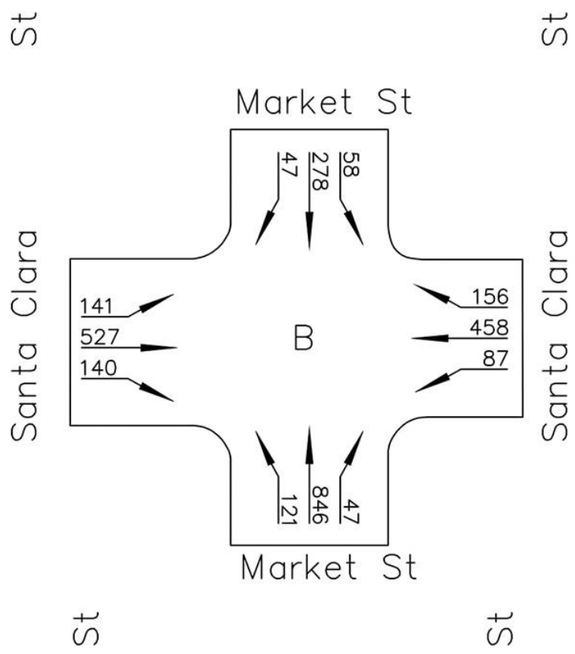


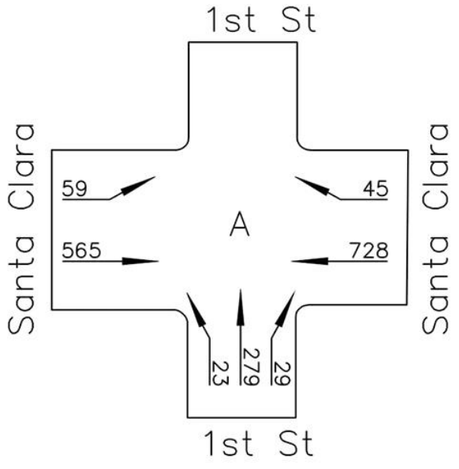
DETAIL 3

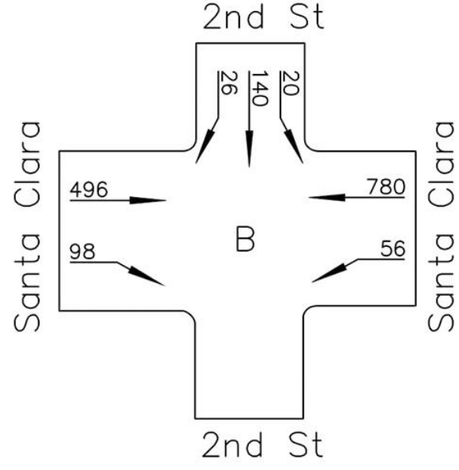
PAVEMENT MARKINGS
LETTERING

ZHEJIANG UNIVERSITY			D-3
DRAWN BY:	REAHSAK LY	DETAIL SHEETS	SHEET 24 OF 48
CHECKED BY:	YUANSHENG YU		
DATE:	12/03/2019		
SCALE:	NO SCALE		



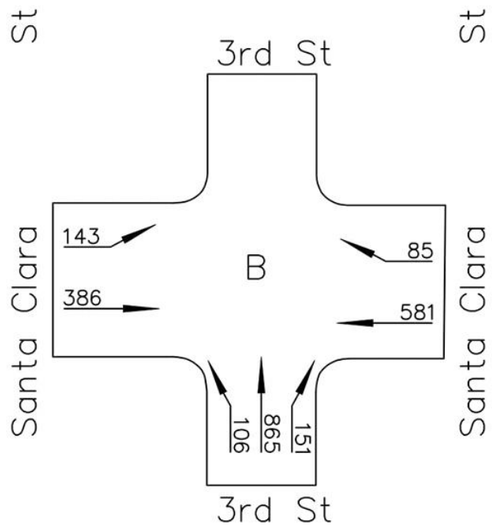


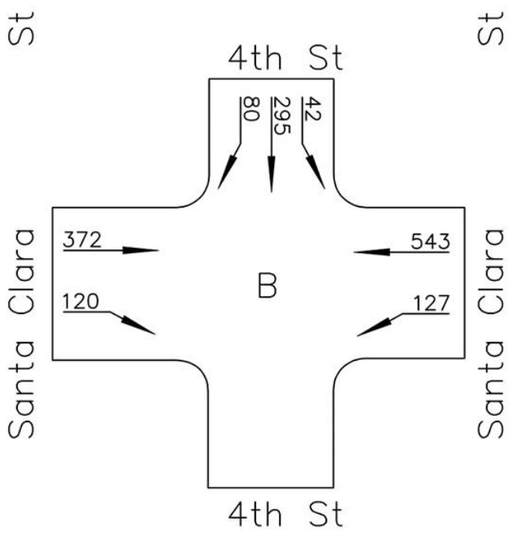


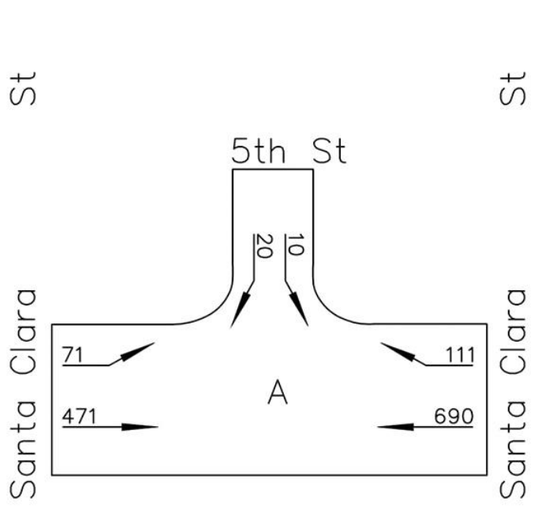


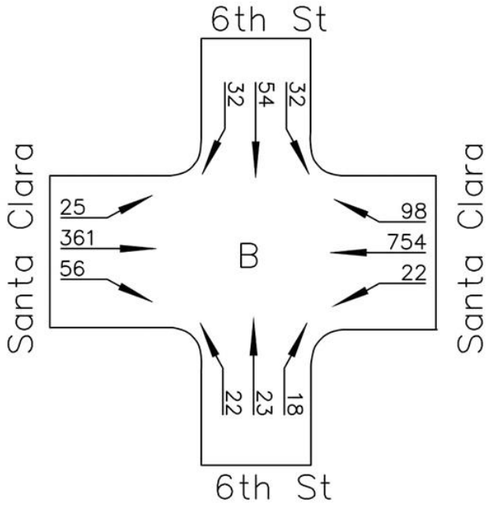
AM PEAK — 2019

ZHEJIANG UNIVERSITY			**TV-1**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 25 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		



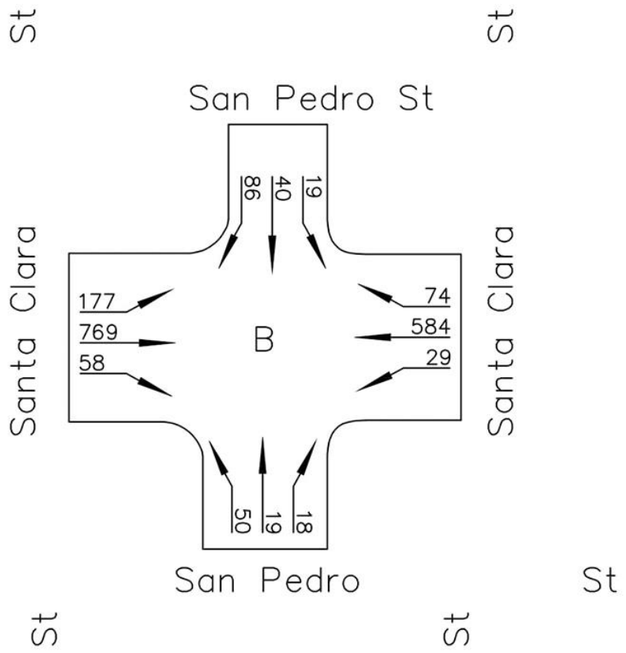


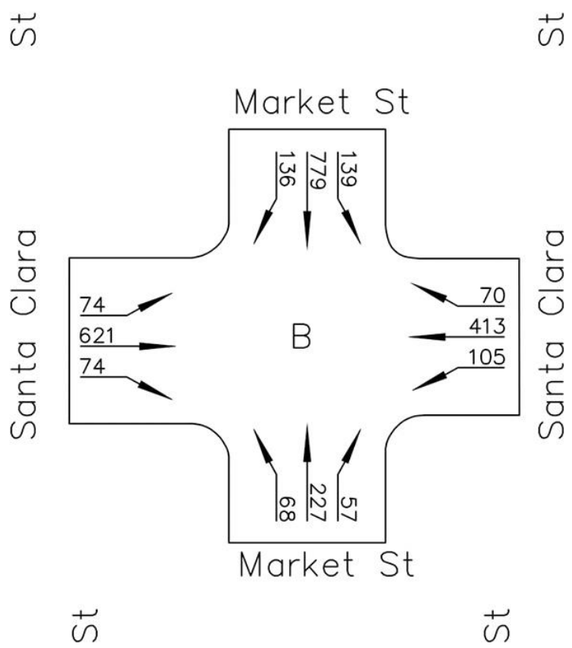


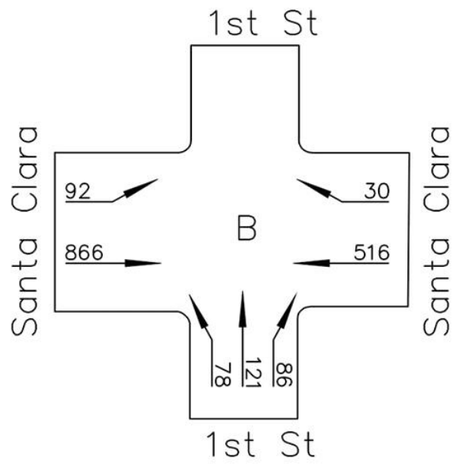


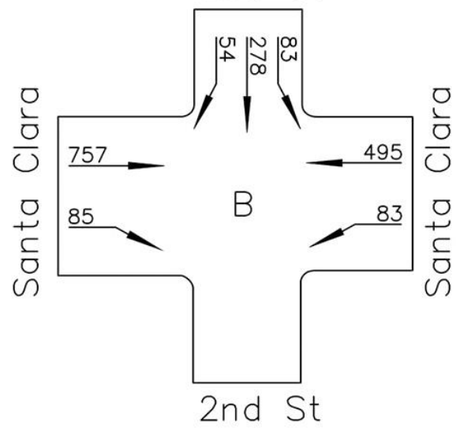
AM PEAK — 2019

ZHEJIANG UNIVERSITY			**TV-2**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 26 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		



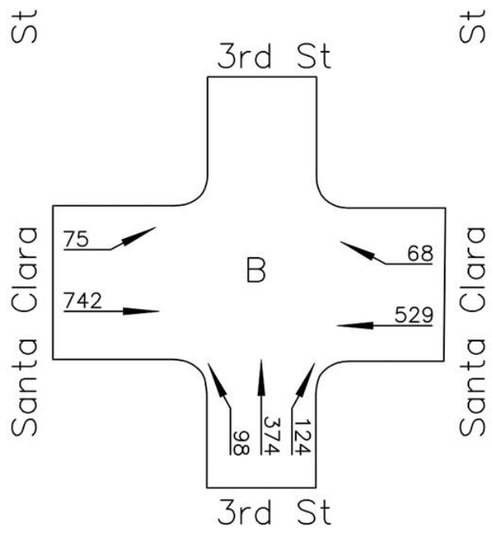


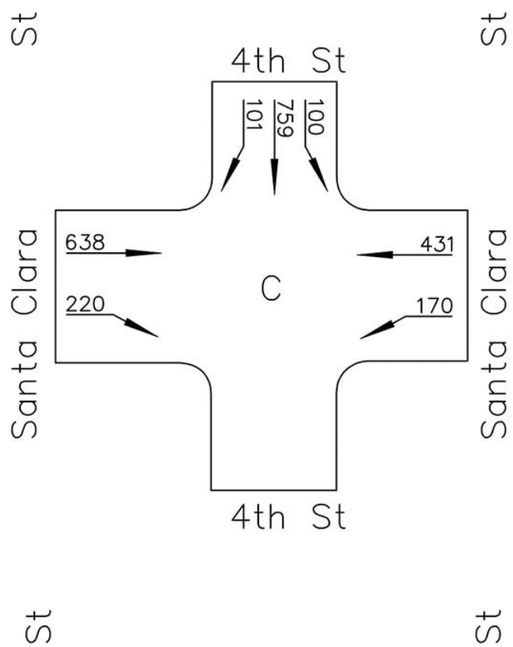


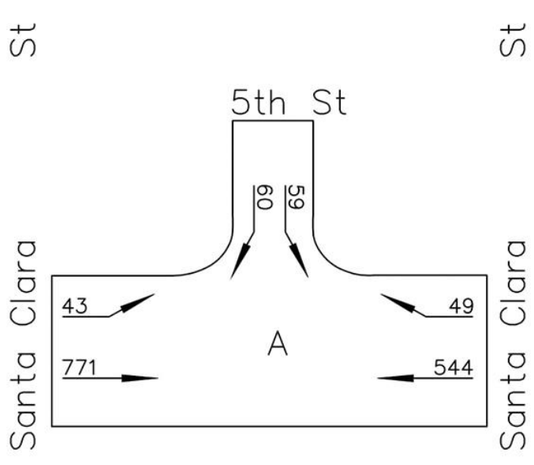


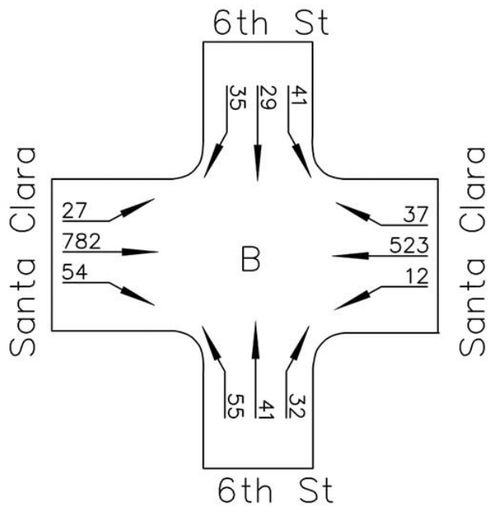
PM PEAK – 2019

ZHEJIANG UNIVERSITY			**TV-3**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 27 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		



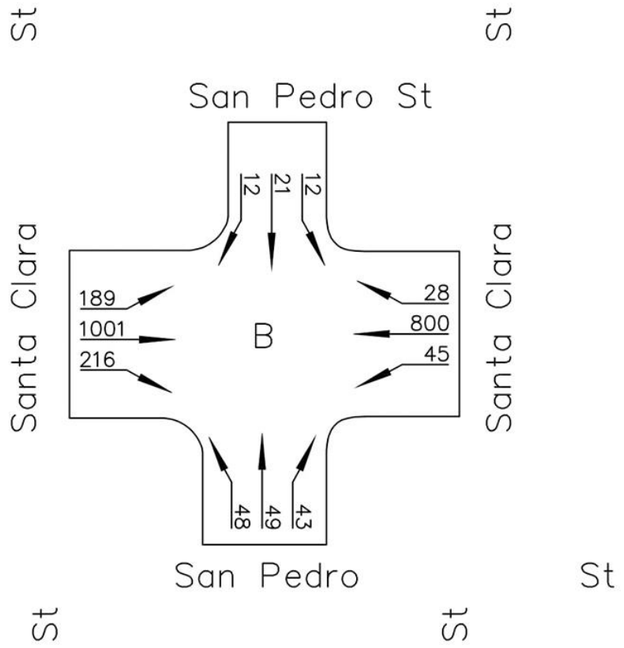


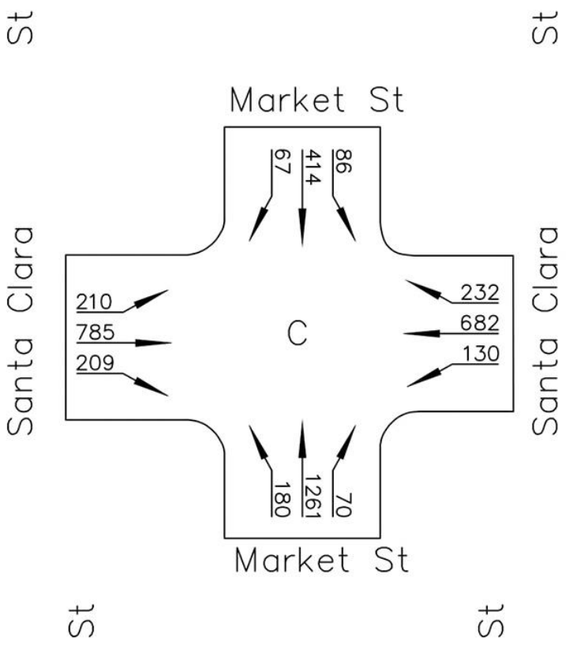


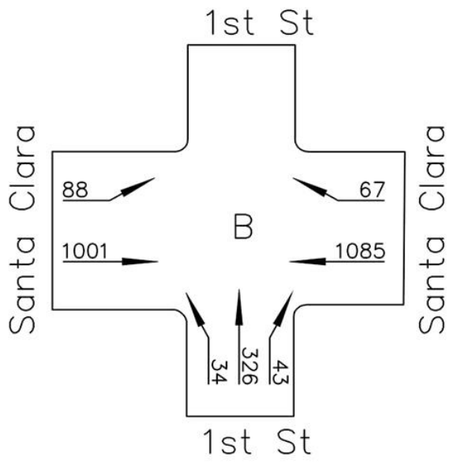


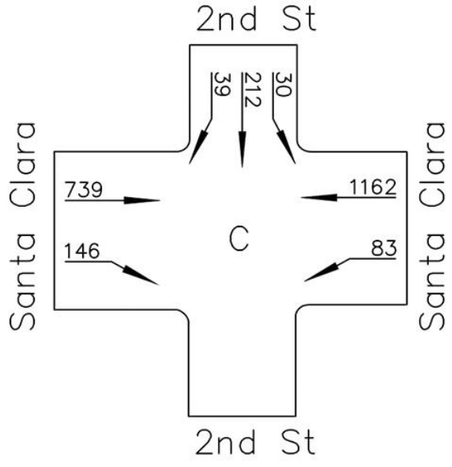
PM PEAK – 2019

ZHEJIANG UNIVERSITY			**TV-4**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 28 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		



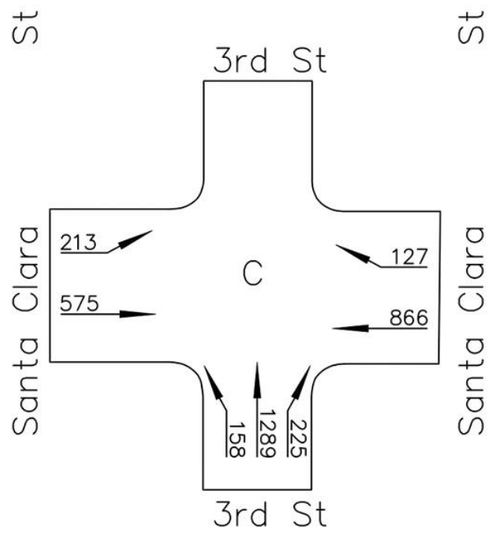


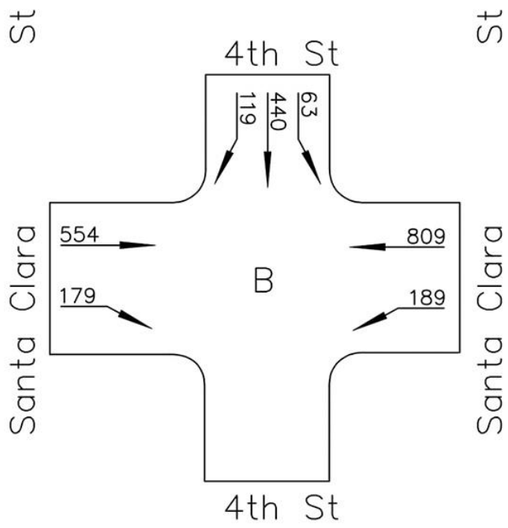


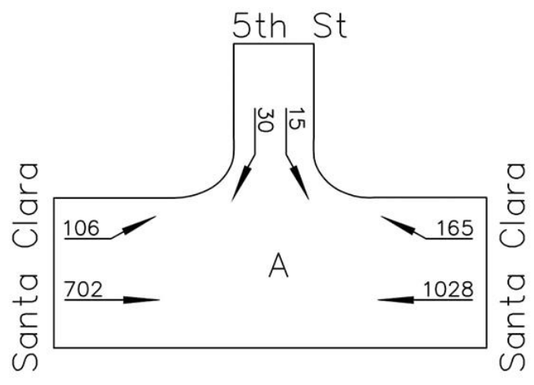


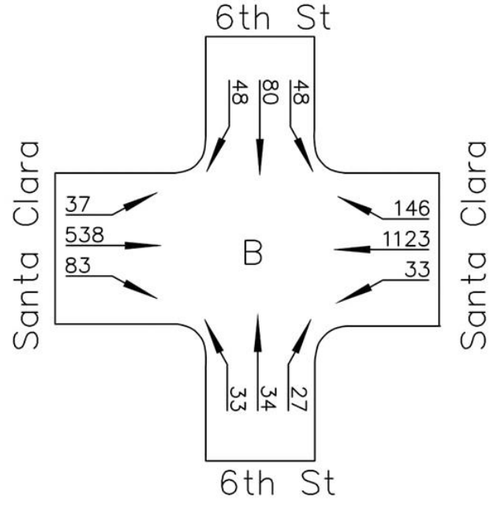
AM PEAK – 2039

ZHEJIANG UNIVERSITY			**TV-5**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 29 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		



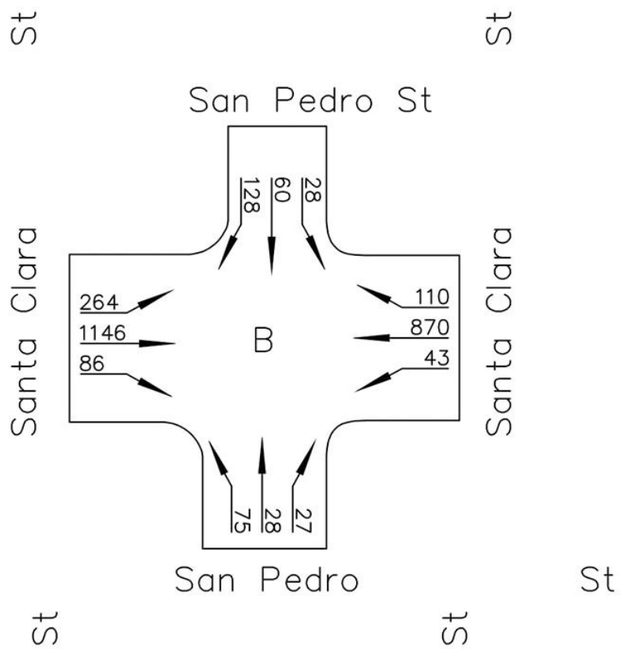


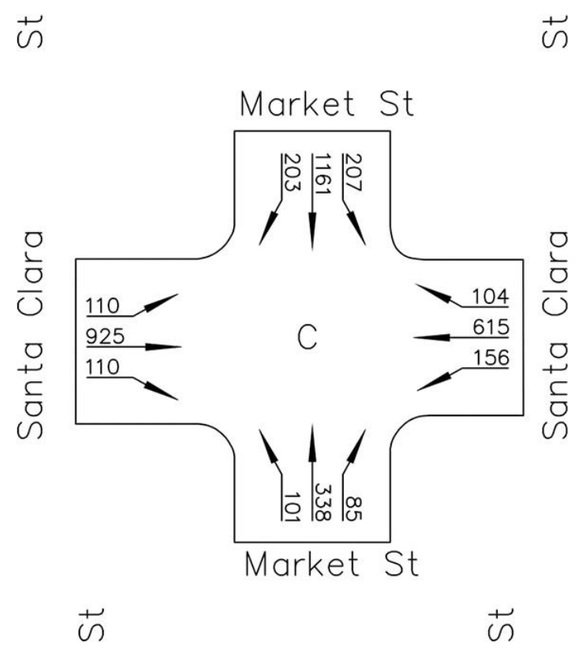


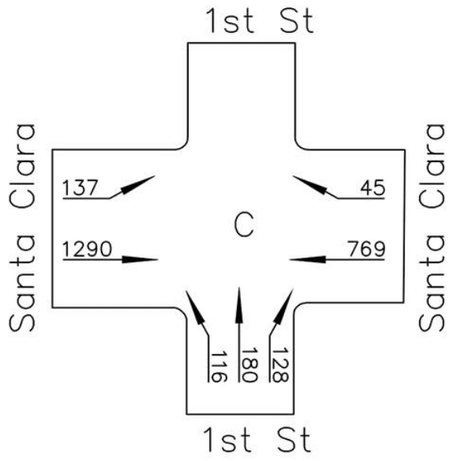


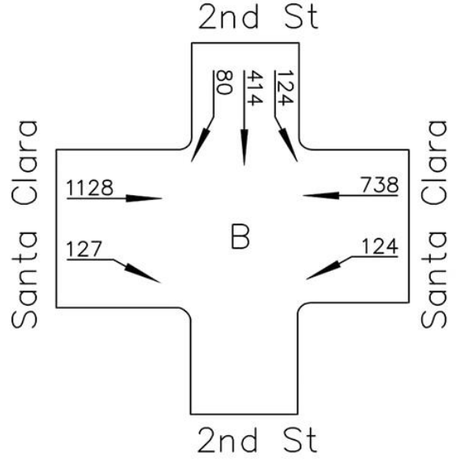
AM PEAK – 2039

ZHEJIANG UNIVERSITY			**TV-6**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 30 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		



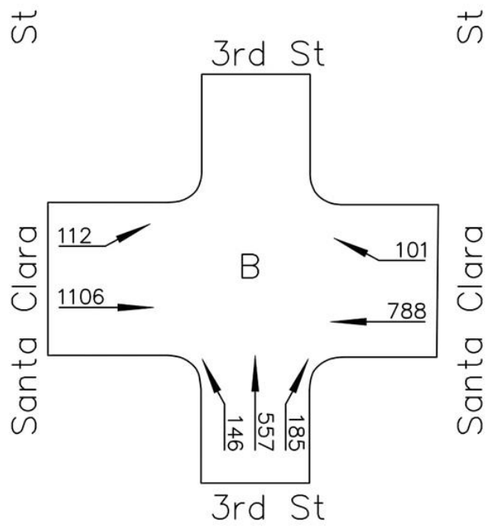


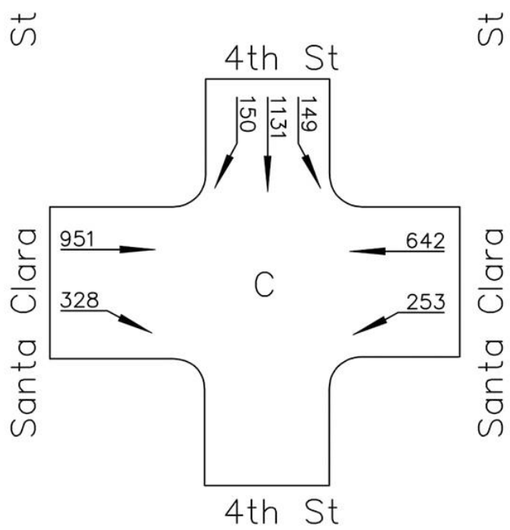


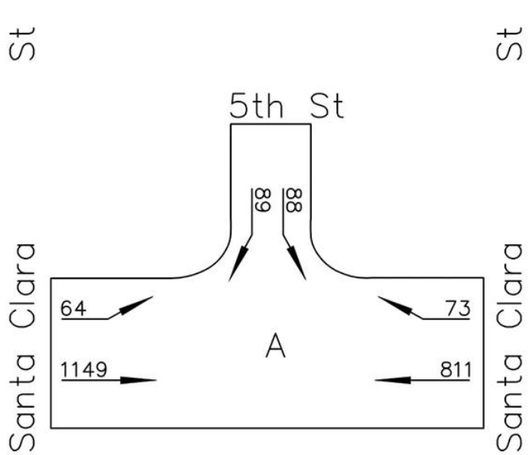


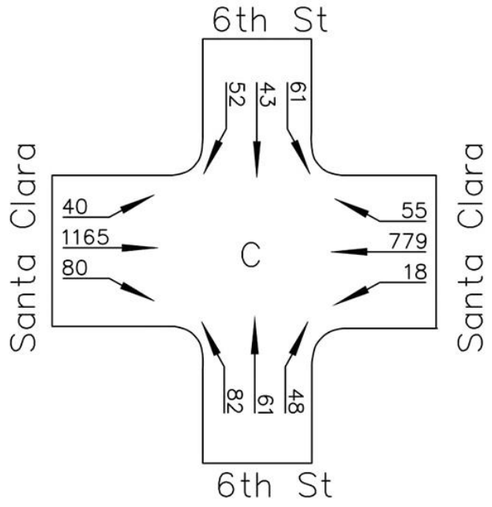
PM PEAK – 2039

ZHEJIANG UNIVERSITY			**TV-7**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 31 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		



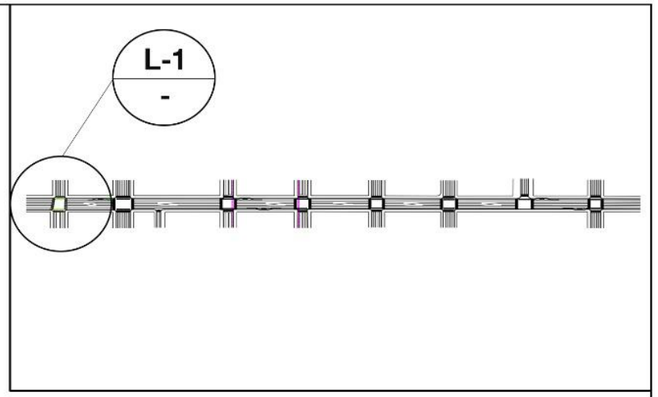


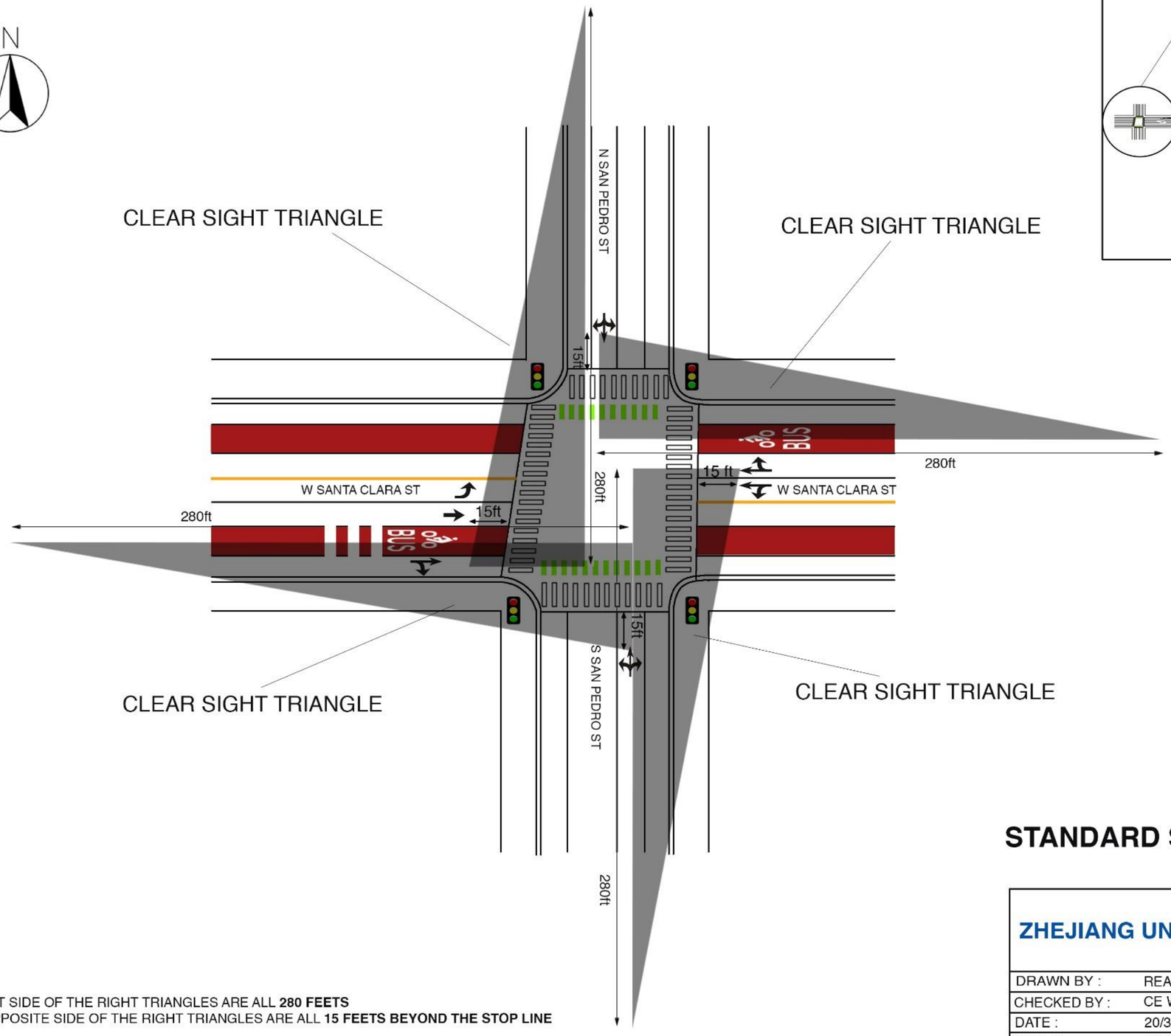




PM PEAK – 2039

ZHEJIANG UNIVERSITY			**TV-8**
DRAWN BY:	YINAN DONG	**INTERSECTION TRAFFIC VOLUME**	SHEET 32 OF 48
CHECKED BY:	REACHSAK LY		
DATE:	17/03/2019		
SCALE:	NO SCALE		





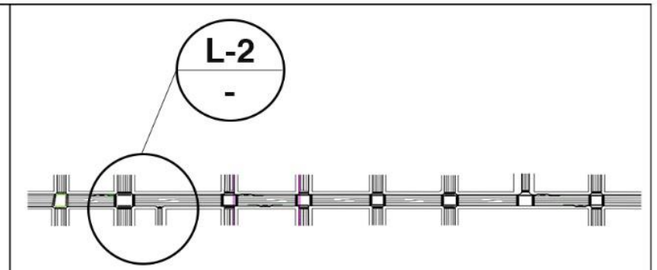
NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**

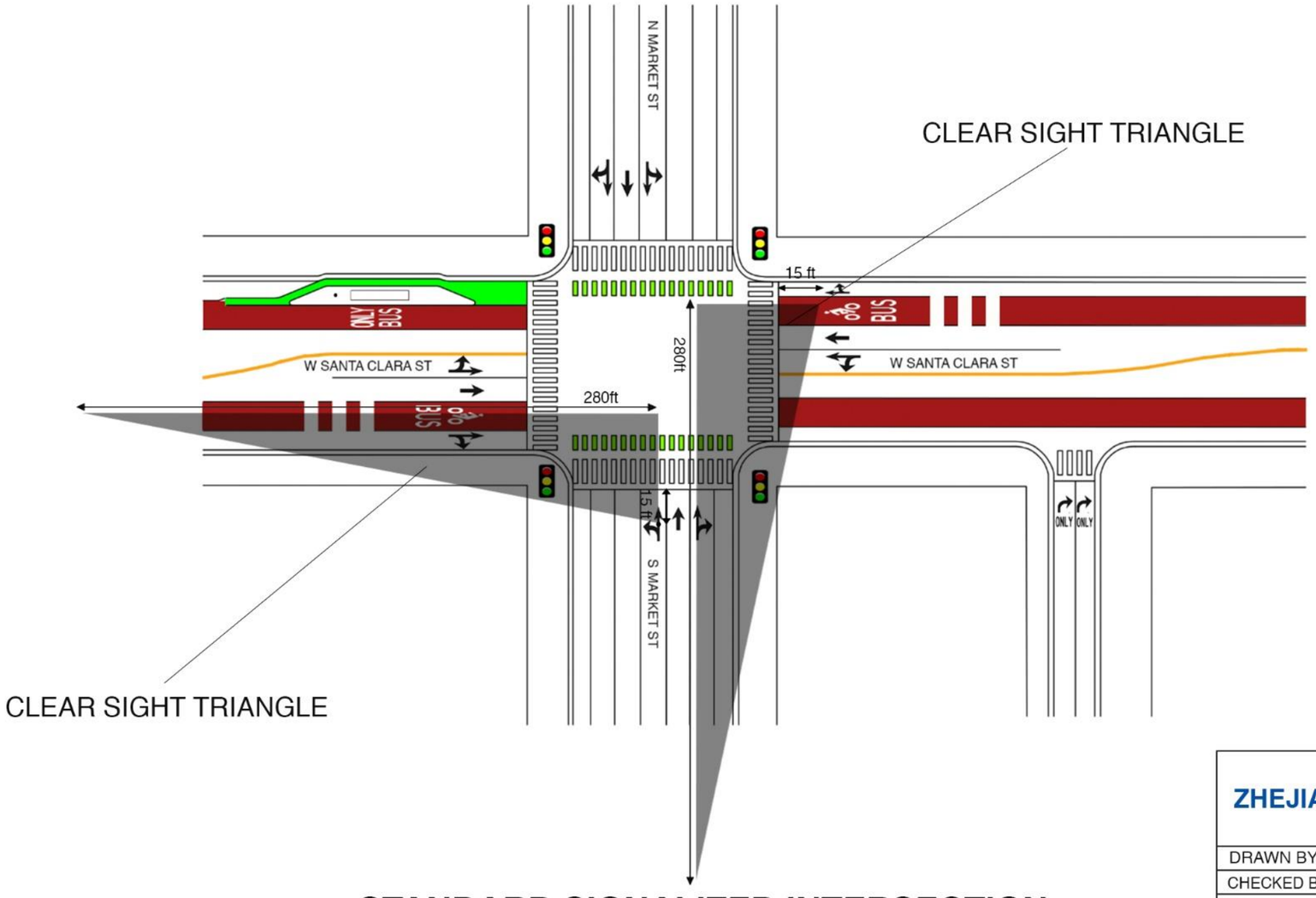
STANDARD SIGNALIZED INTERSECTION

ZHEJIANG UNIVERSITY			**ST-1**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 33 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

N

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



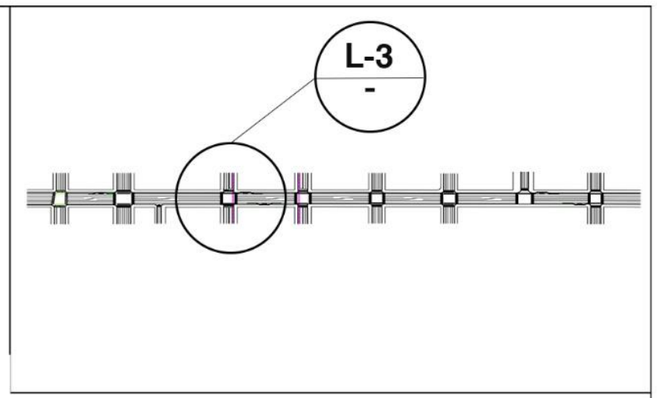


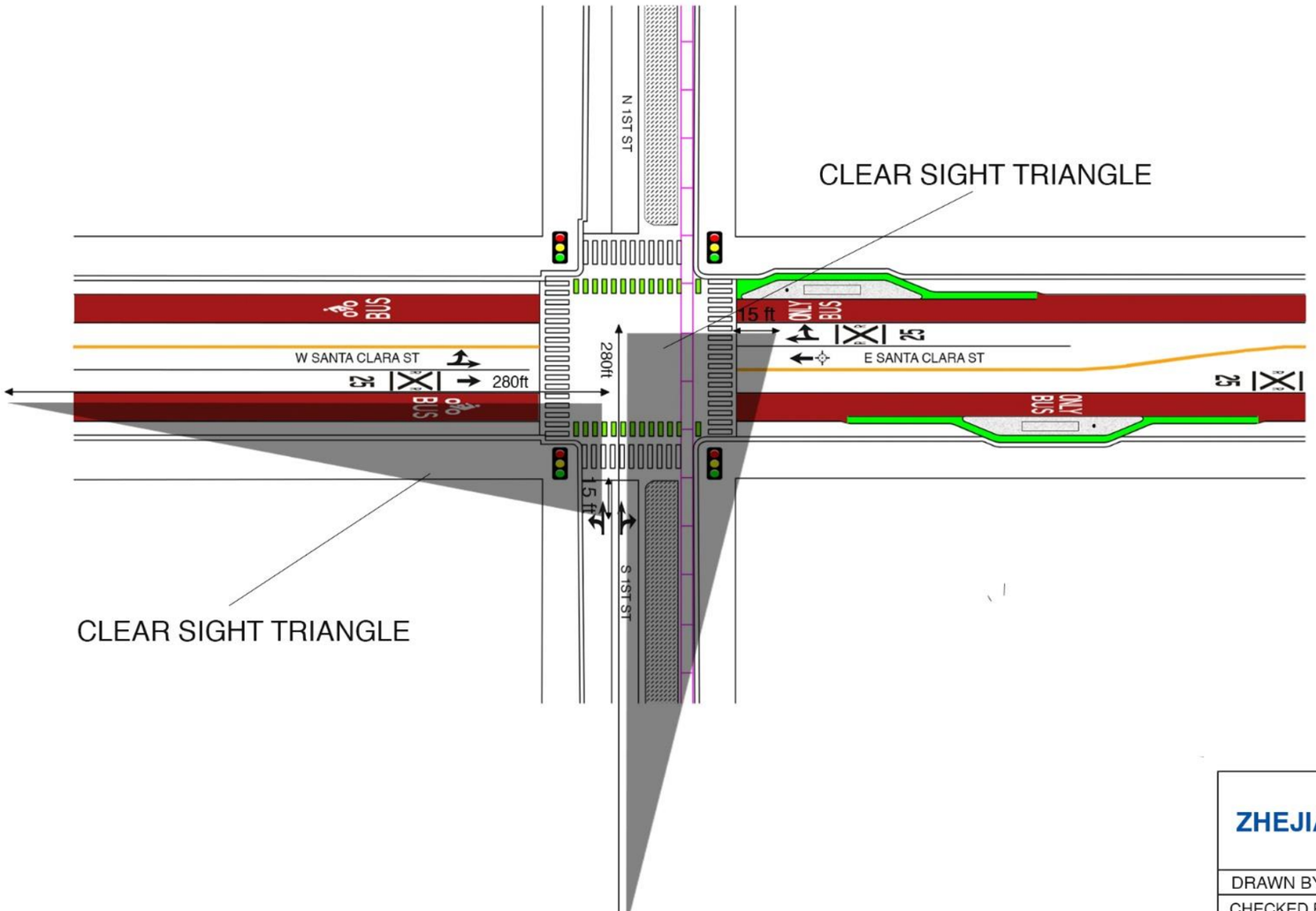
STANDARD SIGNALIZED INTERSECTION

ZHEJIANG UNIVERSITY			**ST-2**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 34 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

N

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



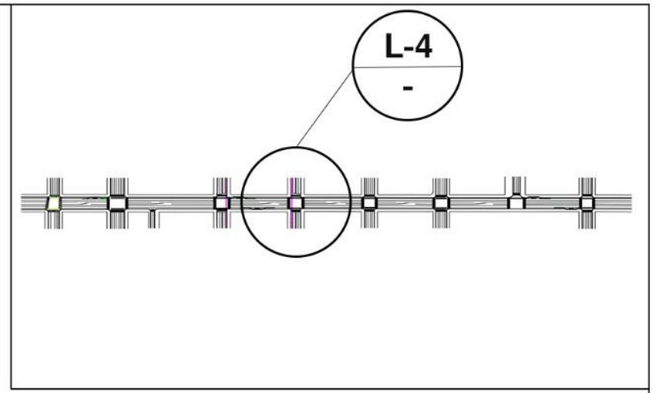


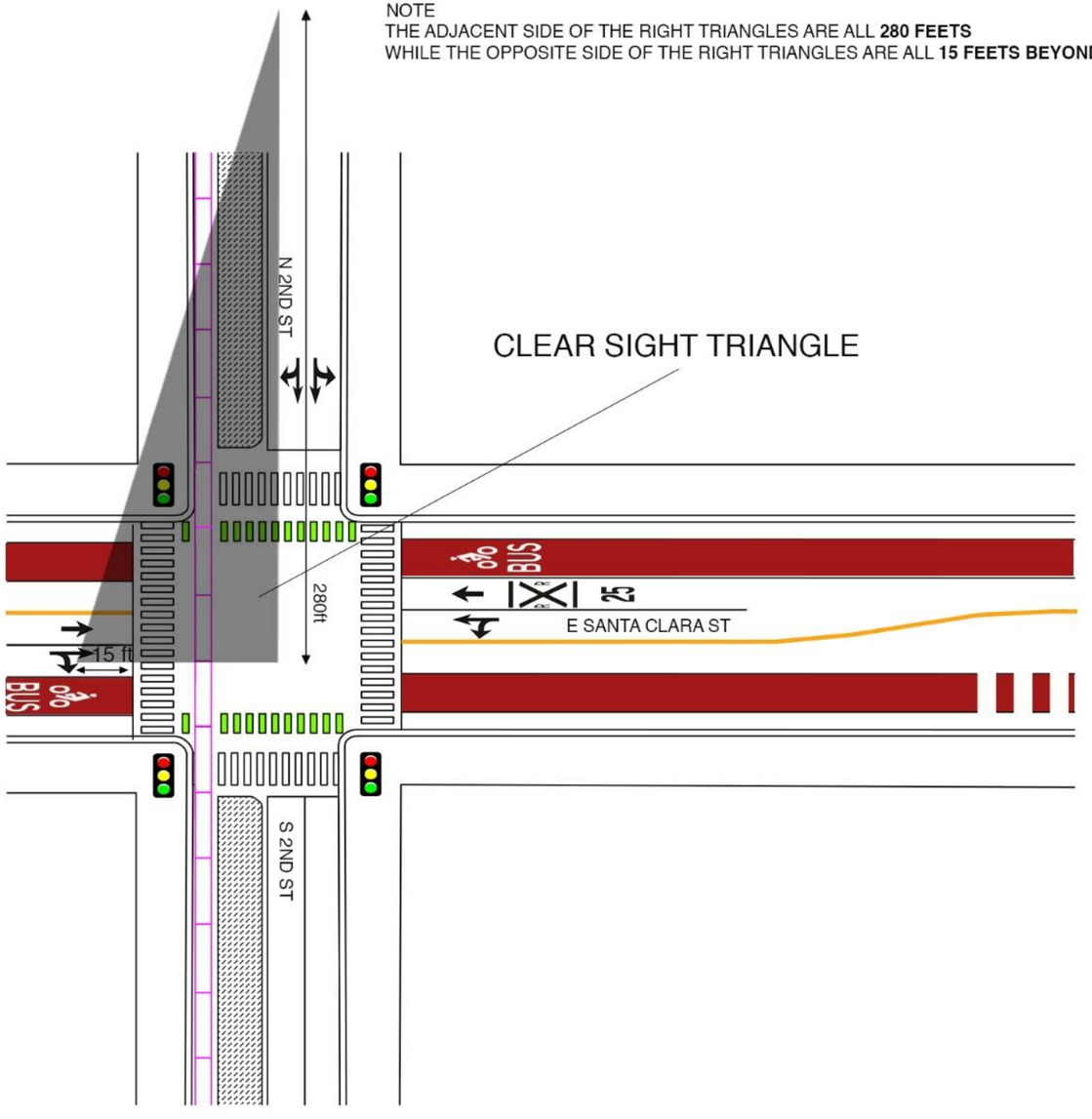
STANDARD SIGNALIZED INTERSECTION

ZHEJIANG UNIVERSITY			ST-3
DRAWN BY :	REACHSAK LY	SIGHT TRIANGLES	SHEET 35 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

N

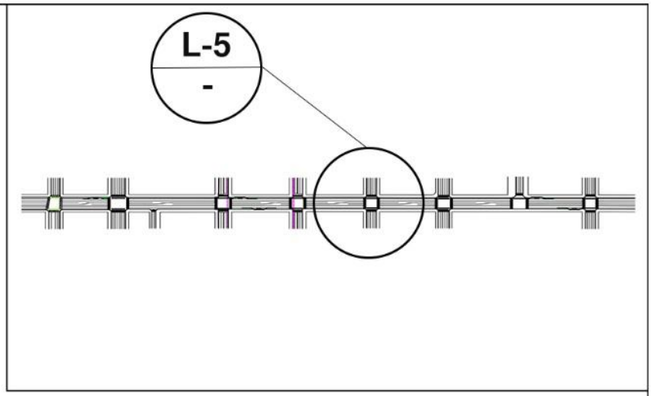
NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**





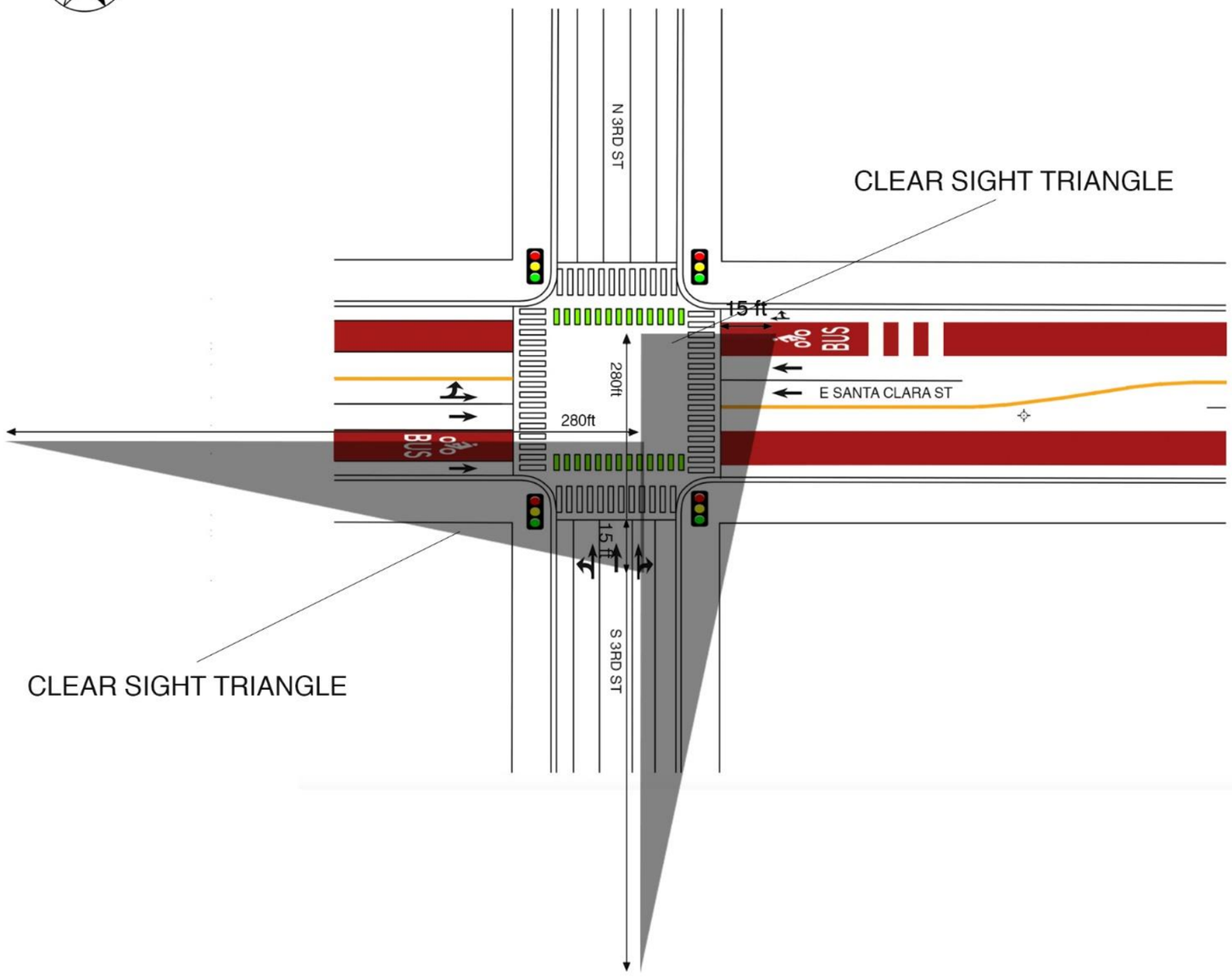
STANDARD SIGNALIZED INTERSECTION

ZHEJIANG UNIVERSITY			ST-4
DRAWN BY :	REACHSAK LY	SIGHT TRIANGLES	SHEET 36 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		



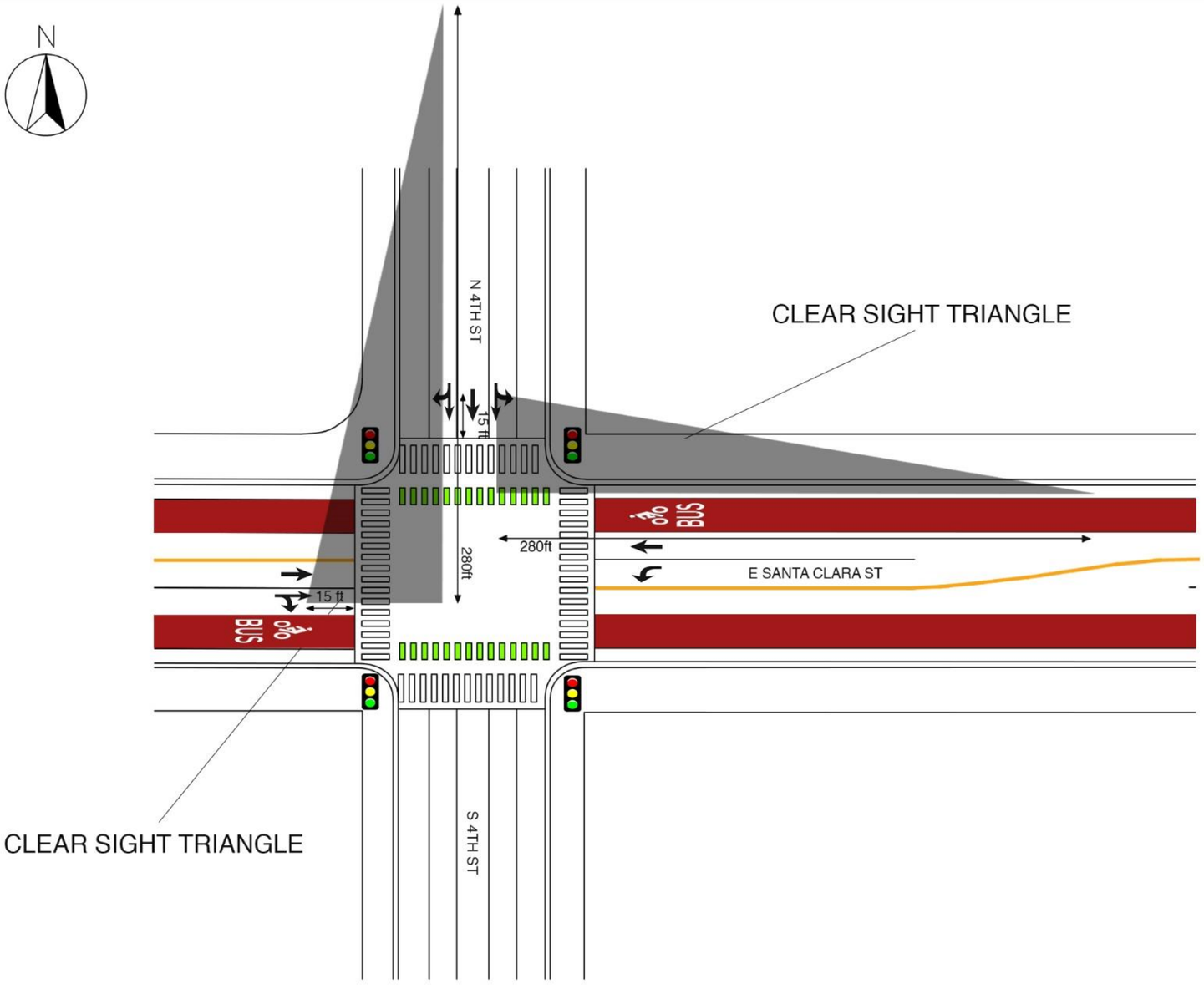
N

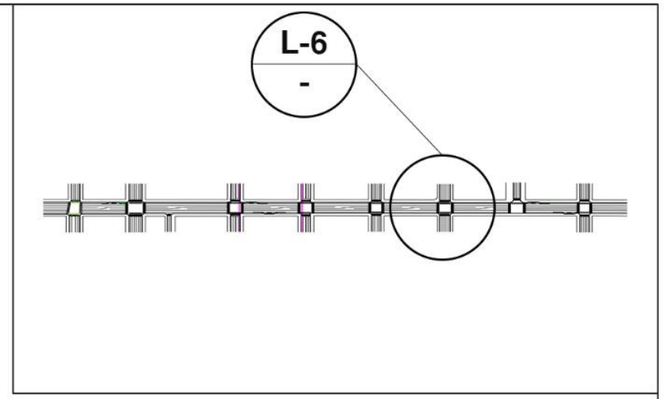
NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



STANDARD SIGNALIZED INTERSECTION

ZHEJIANG UNIVERSITY			**ST-5**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 37 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

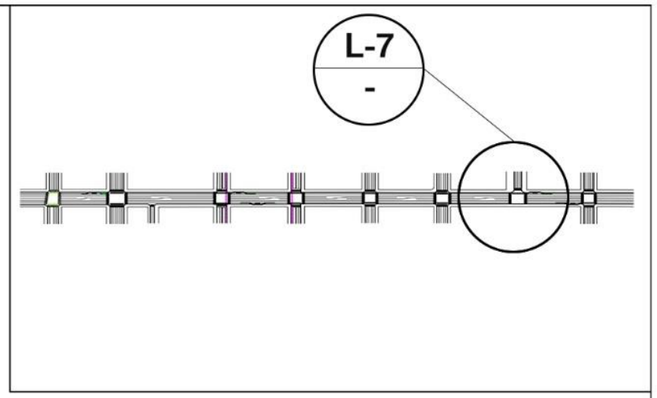


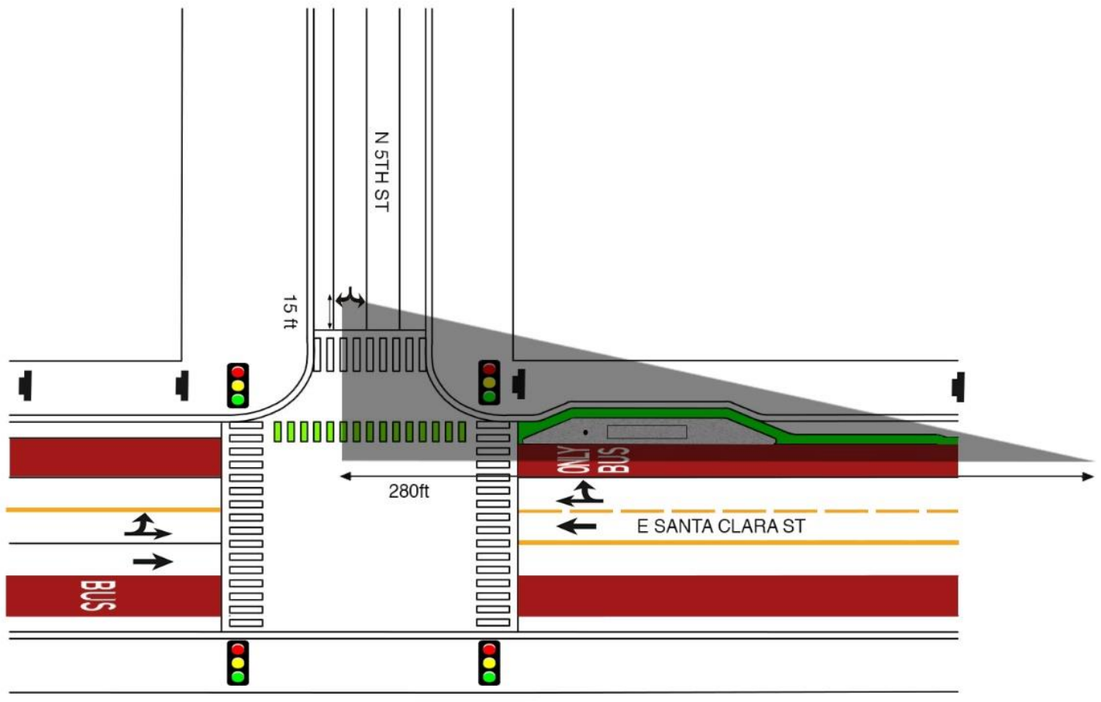


STANDARD SIGNALIZED INTERSECTION

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**

ZHEJIANG UNIVERSITY			**ST-6**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 38 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

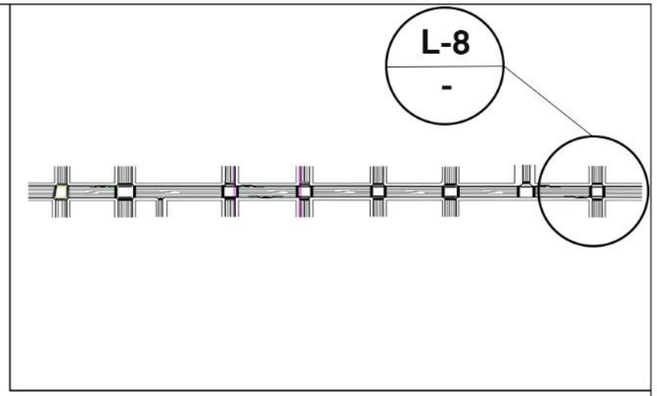




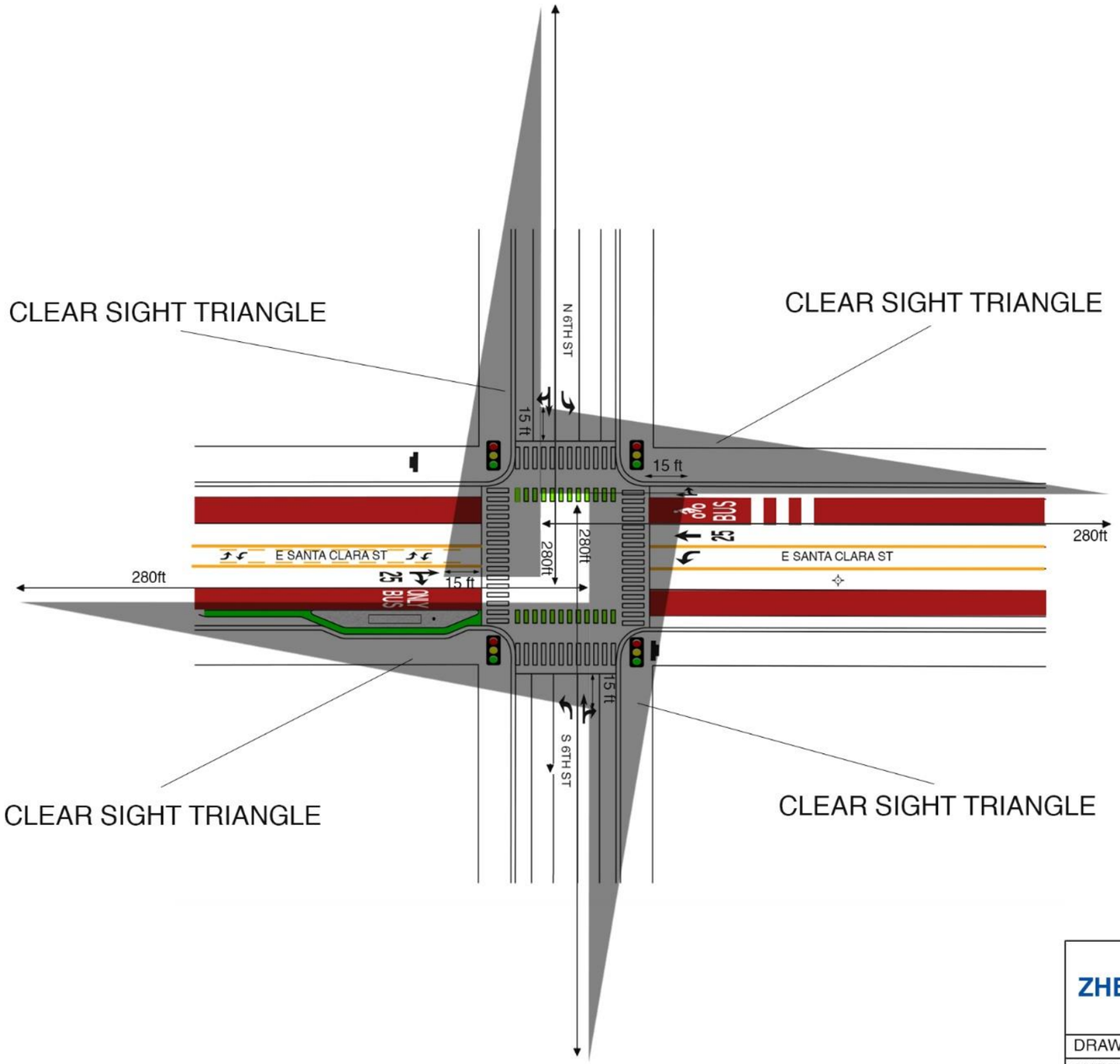
STANDARD SIGNALIZED INTERSECTION

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**

ZHEJIANG UNIVERSITY			**ST-7**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 39 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		



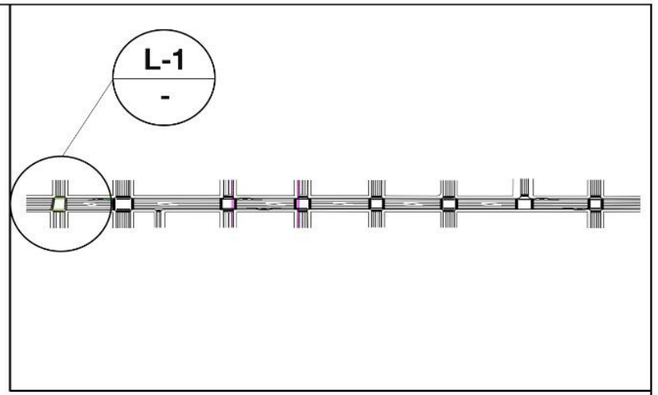
NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**

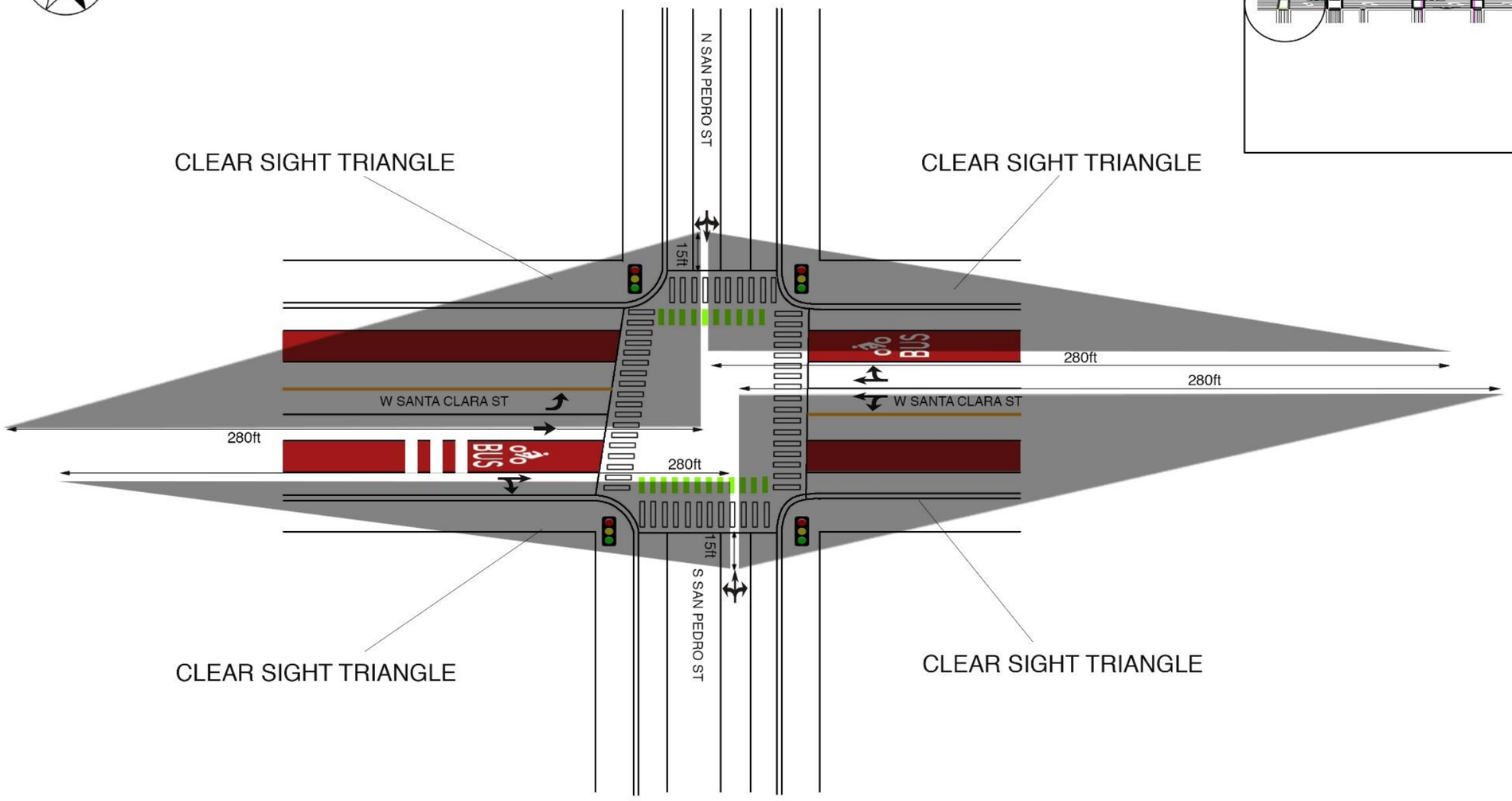


STANDARD SIGNALIZED INTERSECTION

ZHEJIANG UNIVERSITY			**ST-8**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 40 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



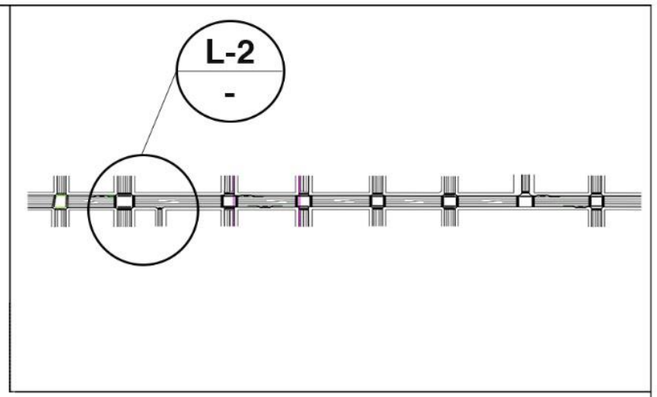


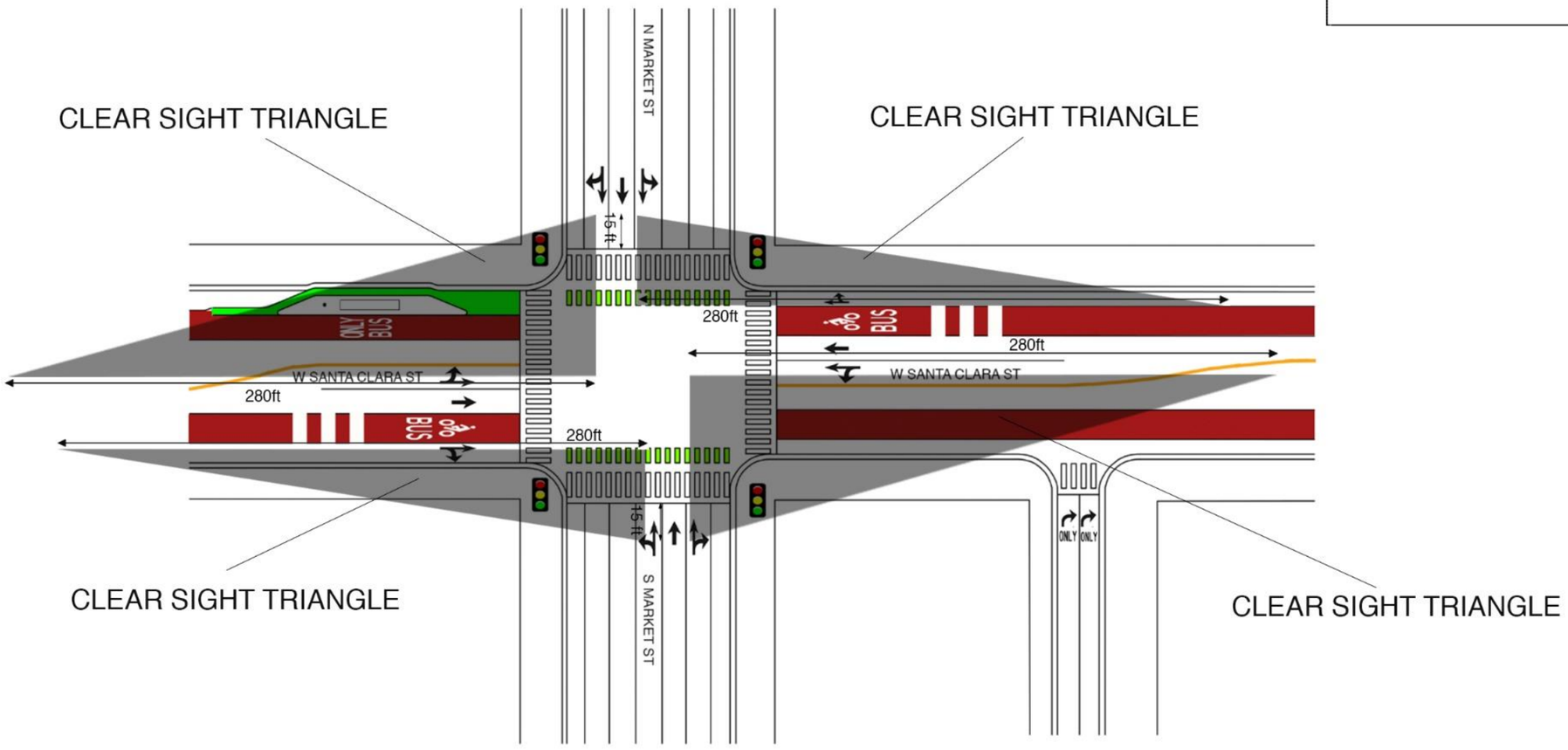
TWO-WAY FLASH OPERATION

ZHEJIANG UNIVERSITY			**ST-9**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 41 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

N

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



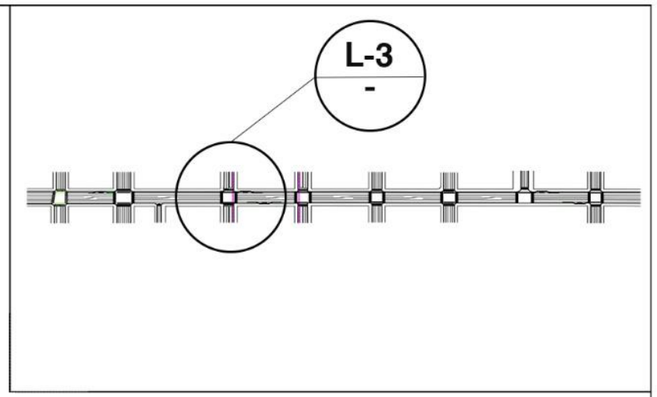


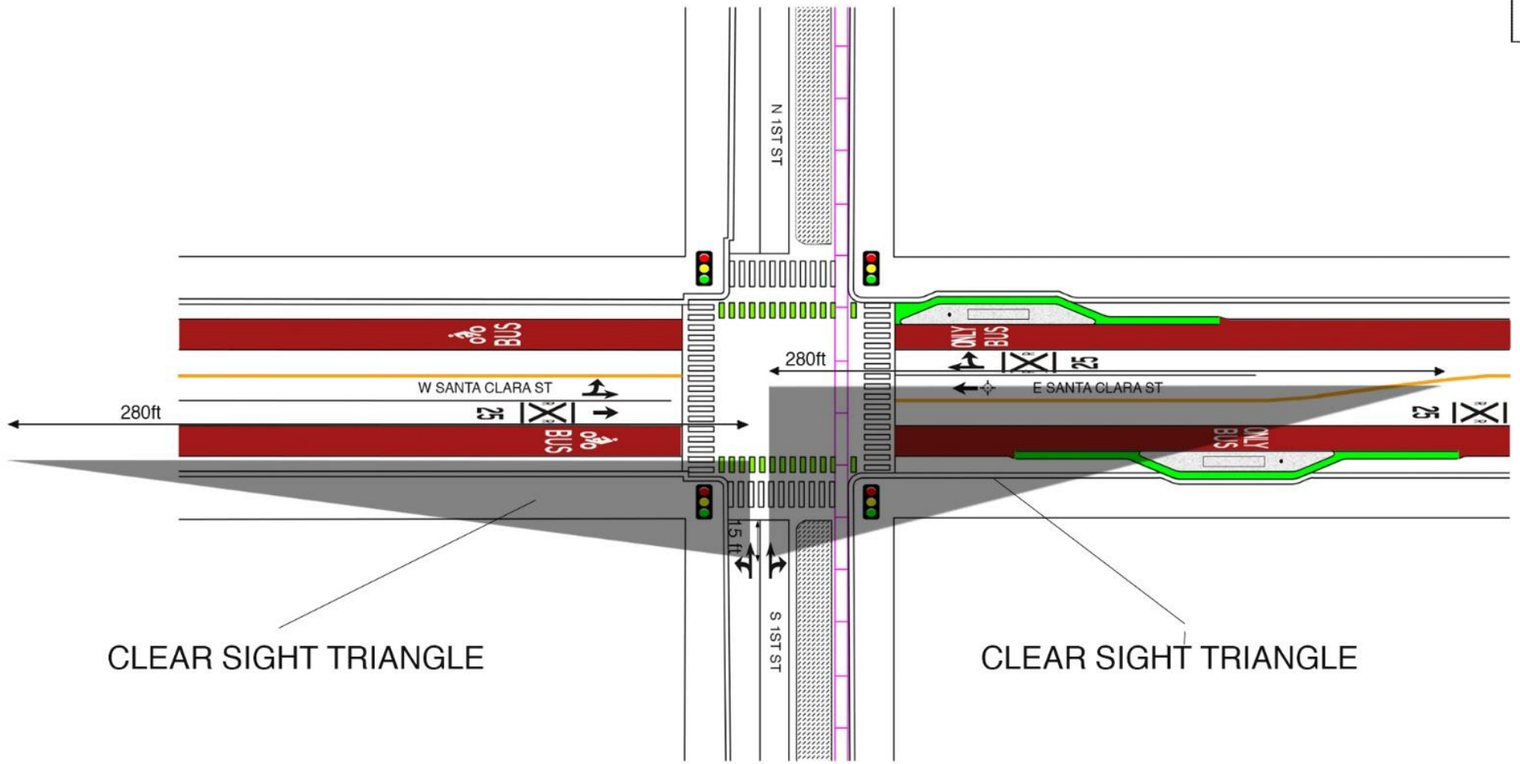
TWO-WAY FLASH OPERATION

ZHEJIANG UNIVERSITY			**ST-10**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 42 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

N

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



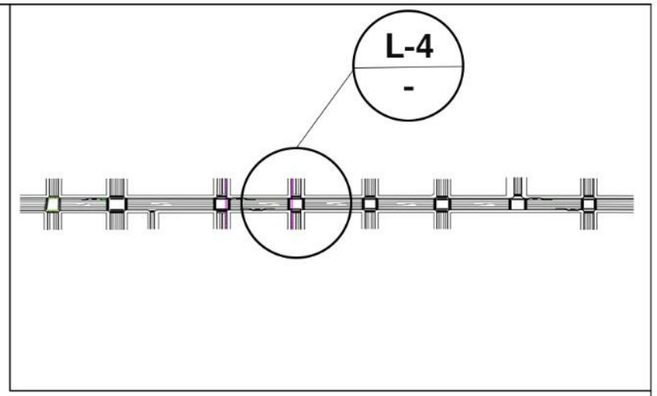


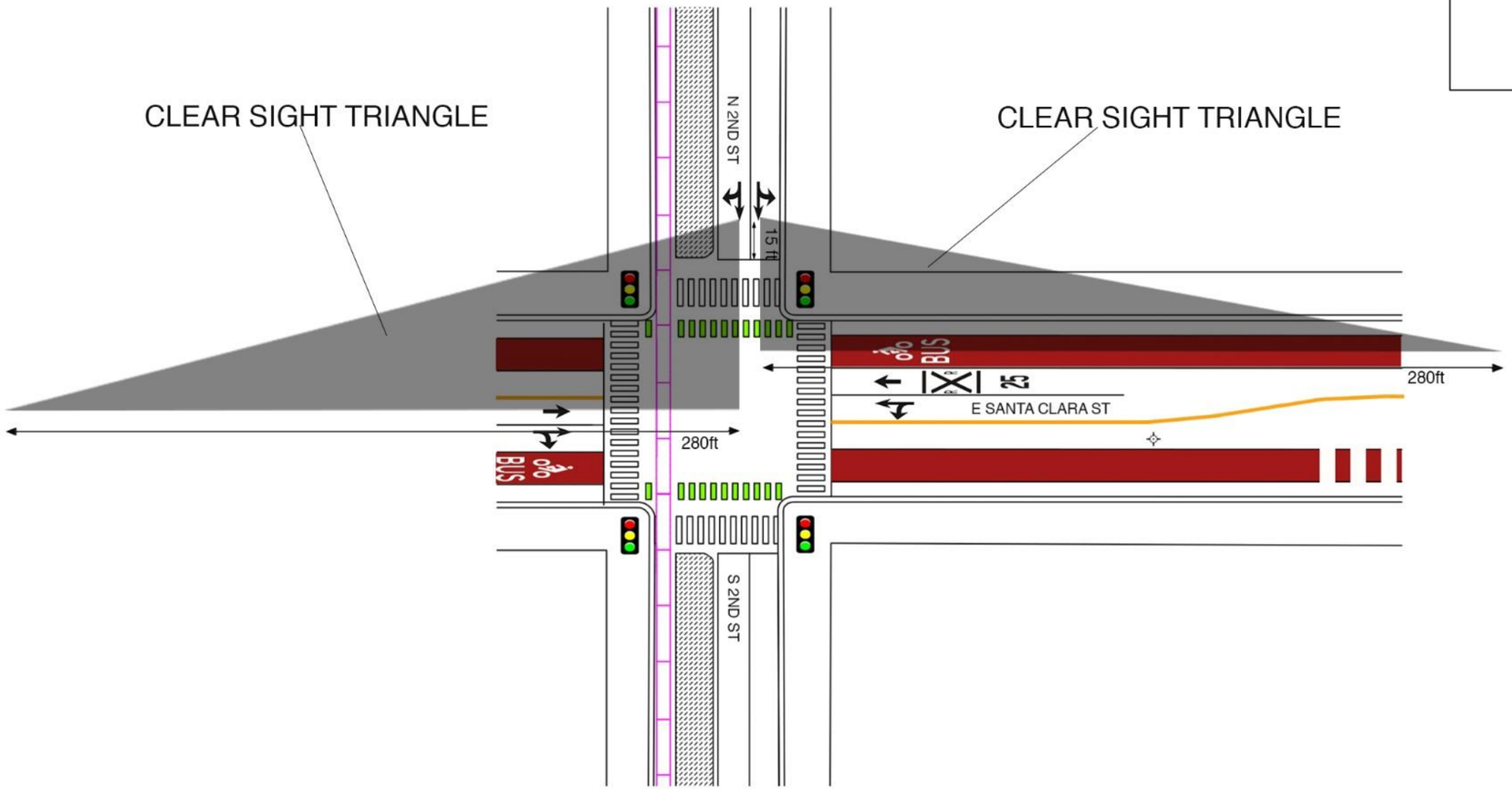
TWO-WAY FLASH OPERATION

ZHEJIANG UNIVERSITY			ST-11
DRAWN BY :	REACHSAK LY	SIGHT TRIANGLES	SHEET 43 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

N

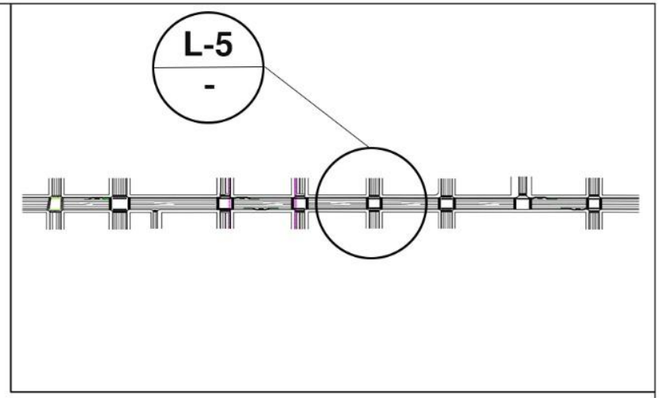
NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



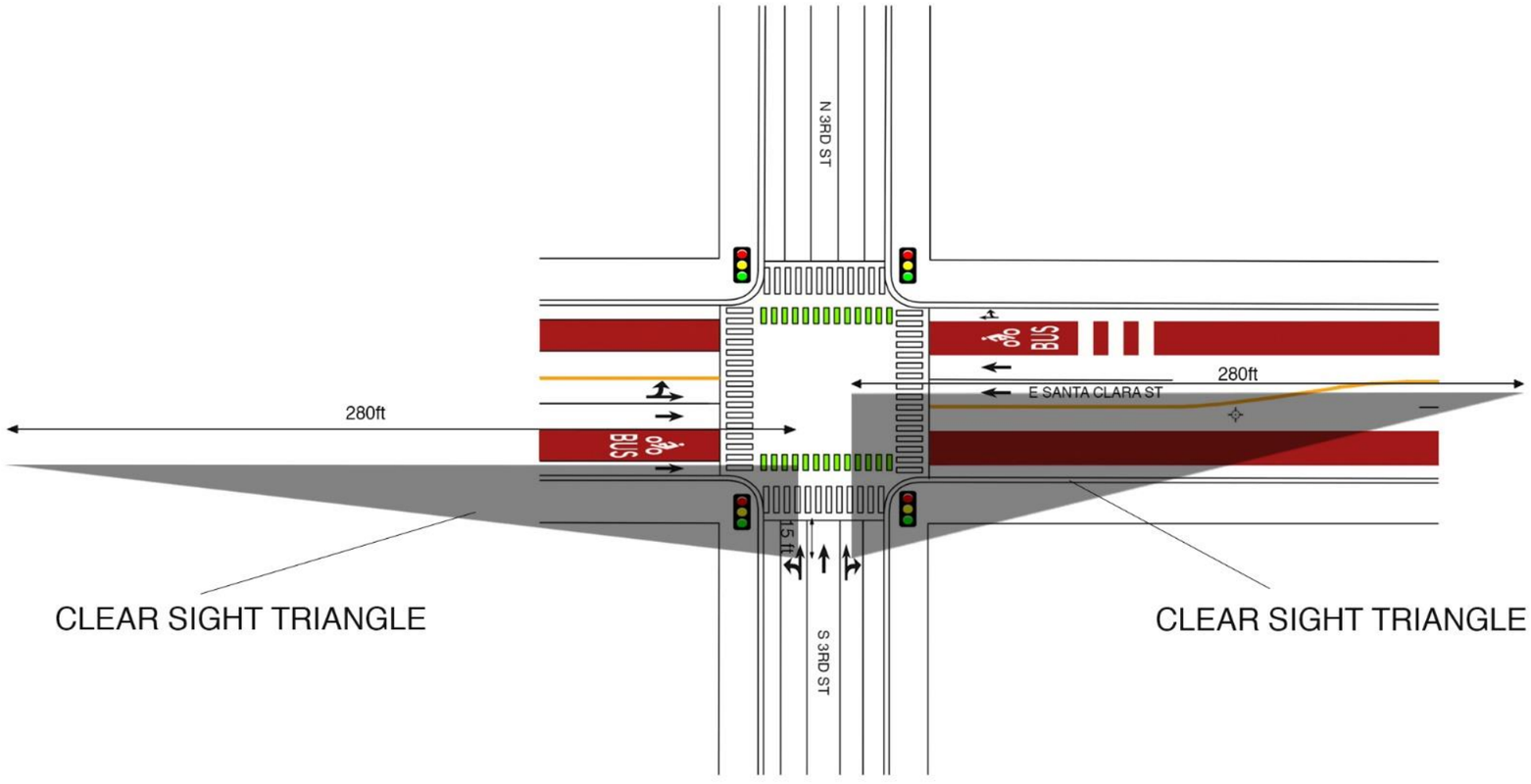


TWO-WAY FLASH OPERATION

ZHEJIANG UNIVERSITY			ST-12
DRAWN BY :	REACHSAK LY	SIGHT TRIANGLES	SHEET 44 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

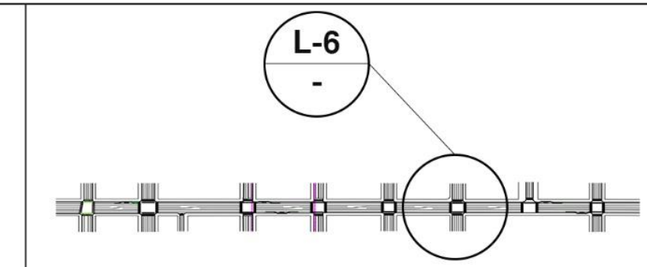


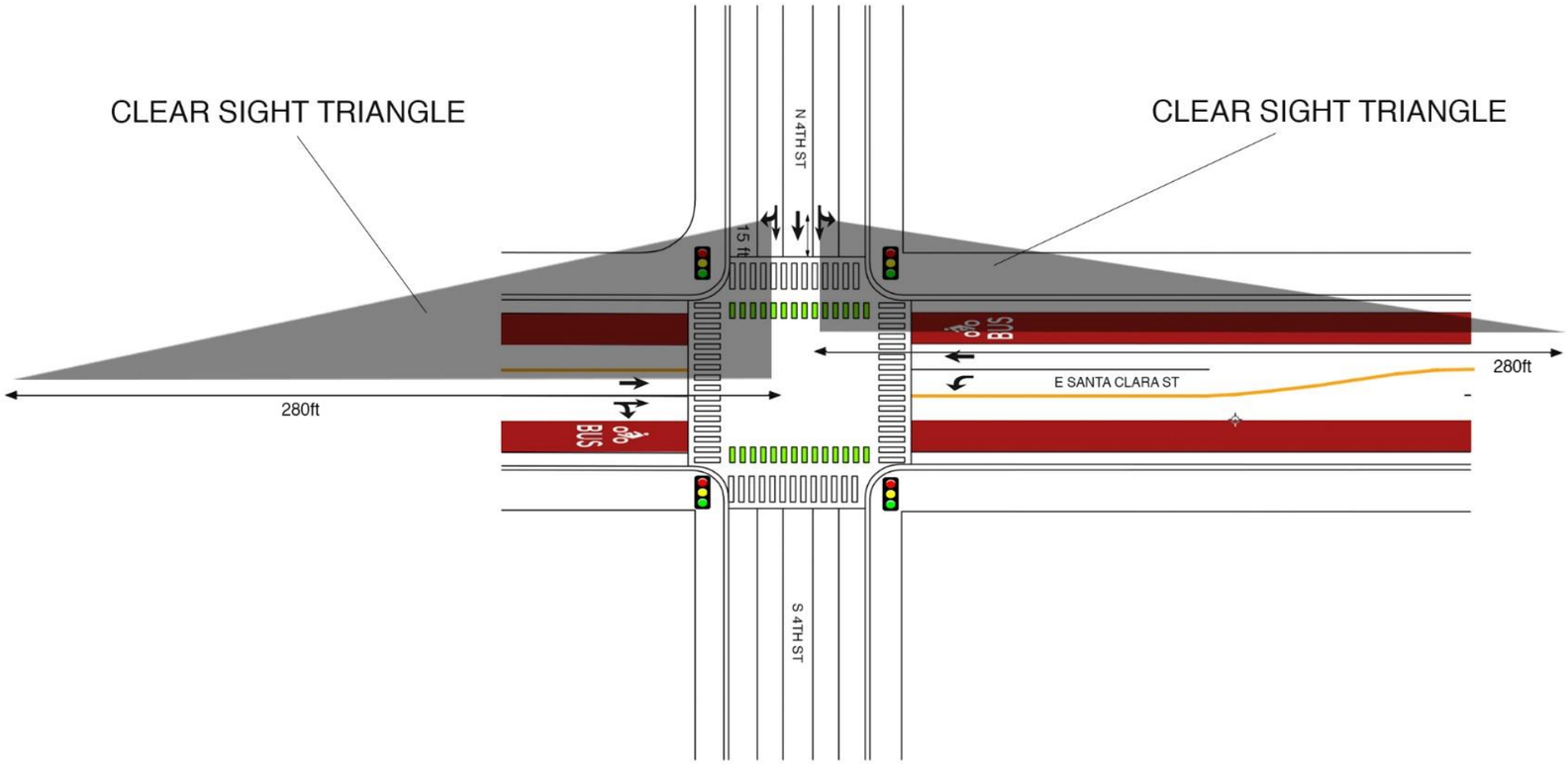
NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**



TWO-WAY FLASH OPERATION

ZHEJIANG UNIVERSITY			ST-13
DRAWN BY :	REACHSAK LY	SIGHT TRIANGLES	SHEET 45 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

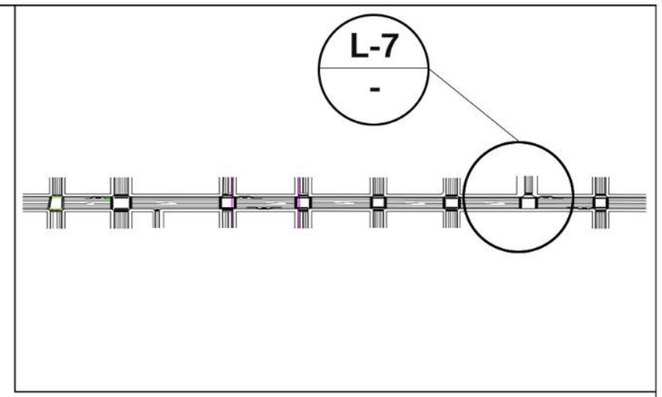


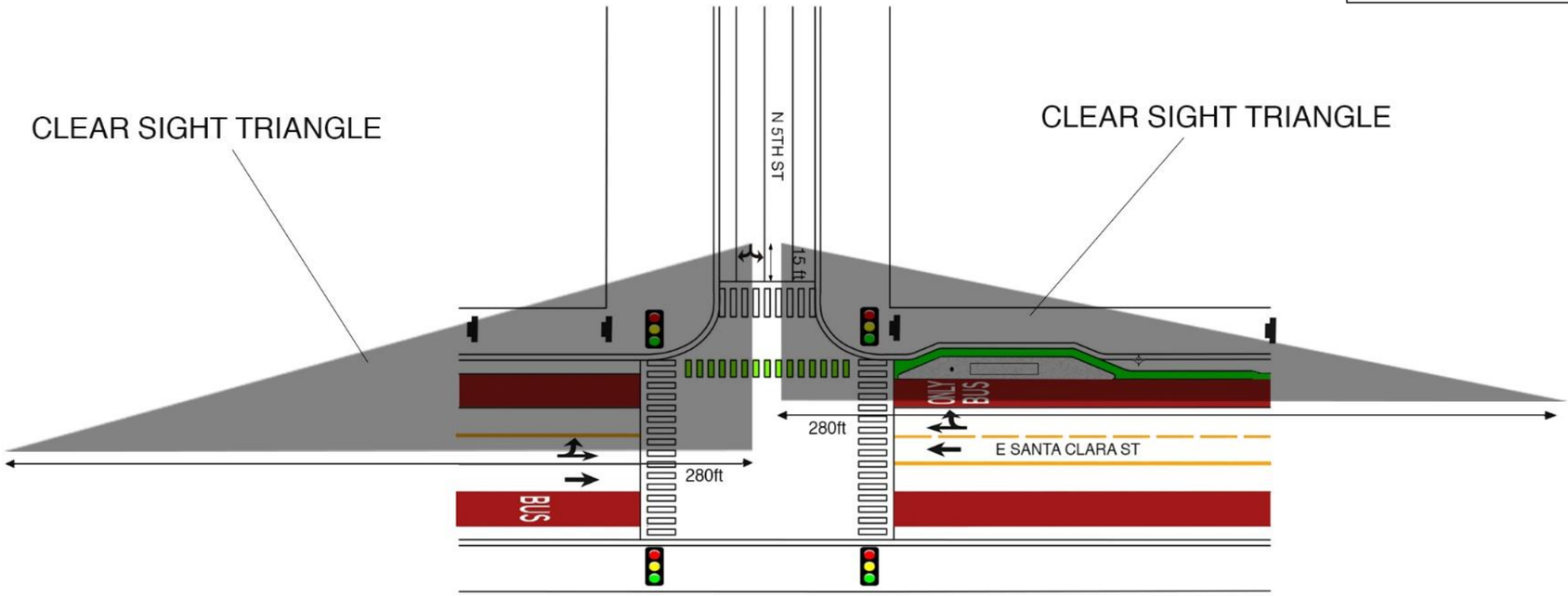


TWO-WAY FLASH OPERATION

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**

ZHEJIANG UNIVERSITY			ST-14
DRAWN BY :	REACHSAK LY	SIGHT TRIANGLES	SHEET 46 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		





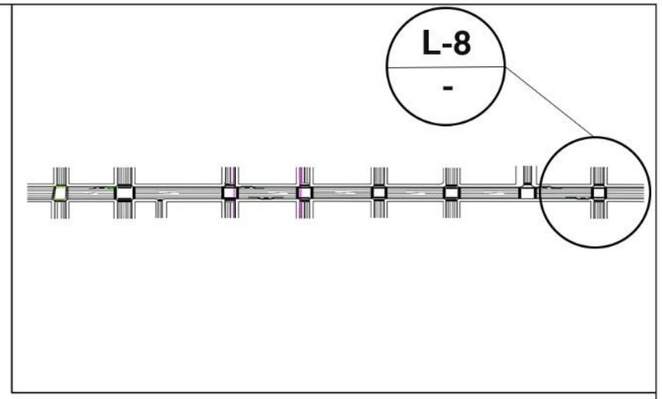
TWO-WAY FLASH OPERATION

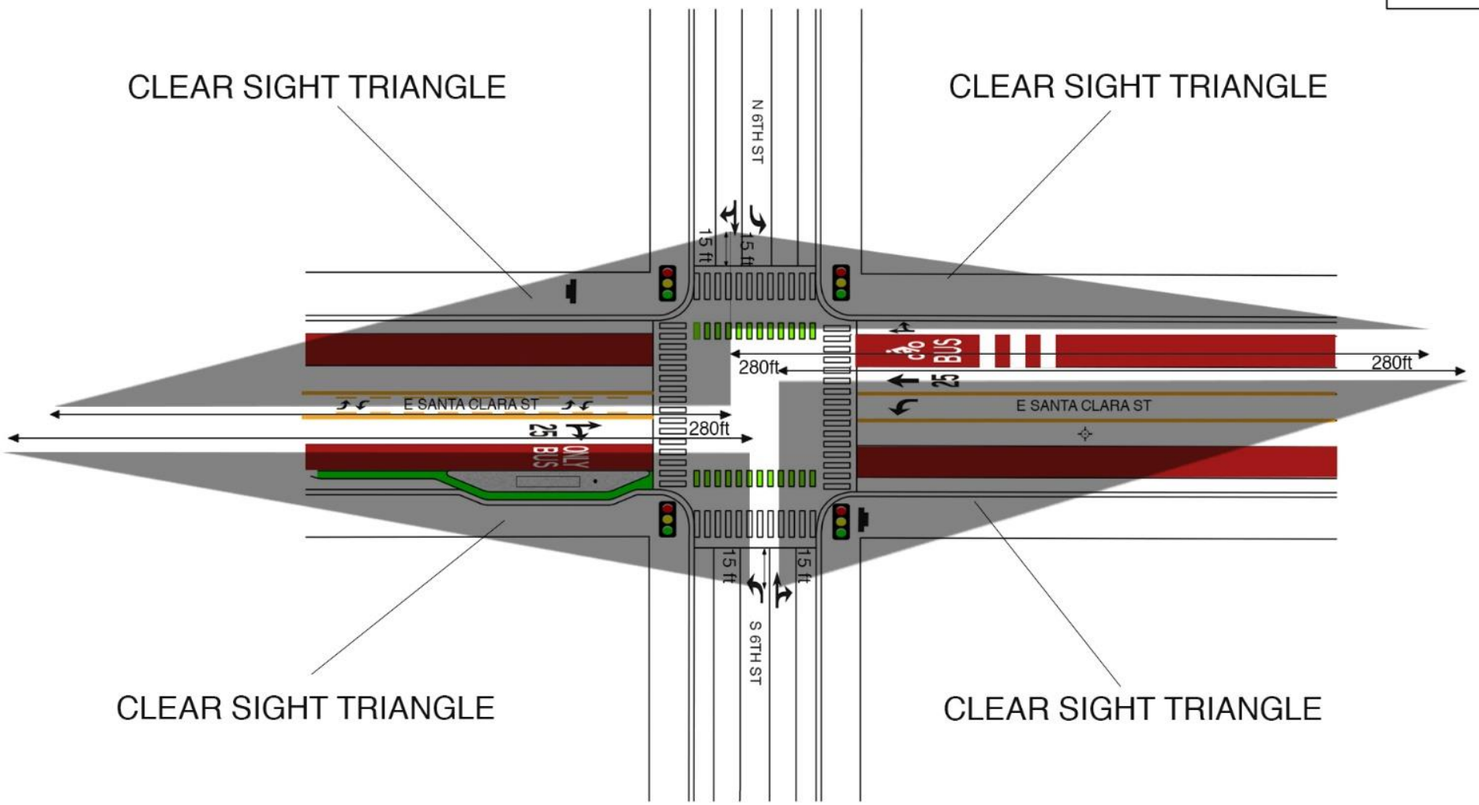
NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**

ZHEJIANG UNIVERSITY			**ST-15**
DRAWN BY :	REACHSAK LY	**SIGHT TRIANGLES**	SHEET 47 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

N

NOTE
THE ADJACENT SIDE OF THE RIGHT TRIANGLES ARE ALL **280 FEETS**
WHILE THE OPPOSITE SIDE OF THE RIGHT TRIANGLES ARE ALL **15 FEETS BEYOND THE STOP LINE**





TWO-WAY FLASH OPERATION

ZHEJIANG UNIVERSITY			ST-16
DRAWN BY :	REACHSAK LY	SIGHT TRIANGLES	SHEET 48 OF 48
CHECKED BY :	CE WANG		
DATE :	20/3/2019		
SCALE :	AS SHOWN		

Appendix B: Signal Timing and LOS Calculations

The intersection signal timing and LOS are calculated according to the method given in *HCM*, which is composed of the following steps:

1. Calculate the traffic volume of each entrance lane

The design life of this project is 20 years. As the average annual growth rate of traffic is 1%, the traffic volume of the peak hour 20 years later is predicted by Eqn. (1) with the current peak hour traffic volume offered by competition.

$$DHV = CHV \times (1+r)^n \tag{1}$$

where

DHV peak hour traffic volume of design year (veh/h)

CHV the peak hour traffic volume offered by competition in certain year (veh/h)

r the average annual growth rate of traffic volume in the design life (%)

n the gap between the certain year and the design year

As for design traffic volume for selected period of time, it is necessary to determine by the flow direction of each entrance lane at the intersection during period. The calculation formula in refer to Eqn. (2)

$$v_i = \frac{V_i}{PHV} \tag{2}$$

where

v_i demand flow rate for movement i (veh/h)

V_i demand traffic volume for movement i (veh/h)

PHV peak hour factor

2. Calculation of saturation flow

After driveway division and lane channelization of approach lane at intersections, the saturation flow of approach lane varies with the number of lanes and channelization. Therefore, it is necessary to calculate the saturation flow of each entrance lane. Then the saturation flow of each lane is accumulated into saturation flow of each entrance lane. According to *HCM*, the saturation flow of entrance lane can be calculated by Eqn. (3).

$$s = s_0 f_w f_{HV} f_g f_p f_{bb} f_a f_{LU} f_{LR} f_{TR} f_{Lpb} f_{Rpb} \tag{3}$$

where

s adjusted saturation flow rate (veh/h/ln)

s_0 base saturation flow rate (pc/h/ln)

f_w adjustment factor for lane width

f_{HV} adjustment factor for heavy vehicles in traffic stream

f_g adjustment factor for approach grade

f_p adjustment factor for existence of a parking lane and parking activity adjacent to lane group

f_{bb} adjustment factor for blocking effect of local buses that stop within intersection area

f_a adjustment factor for area type

f_{LU} adjustment factor for lane utilization

f_{LT} adjustment factor for left-turn vehicle presence in a lane group

f_{RT} adjustment factor for right-turn vehicle presence in a lane group

f_{Lpb} adjustment factor for left-turn groups

f_{Rpb} adjustment factor for right-turn groups

3. Calculation of timing parameter

1) Calculate the flow ratio, according to Eqn. (4)

$$Y = \max_{1\le i\le 8, 1\le j\le l_i} \left\{ \left(\frac{v}{s} \right)_{ij} \right\} \tag{4}$$

2) Calculate the total loss time

According to *HCM*, the loss time of every phase is taken for 4s, so the total loss time at each intersection is to multiply 4s by the phase number.

3) Calculate the signal cycle length, according to Eqn. (5)

$$C = \frac{L}{1-Y} \tag{5}$$

where

C cycle length (2)

L total loss time (s)

Y sum of flow ratio

4) Calculate the efficient green time of each phase

$$G_e = C - L \tag{6}$$

$$g_{ej} = G_e \frac{y_{cj}}{Y} \tag{7}$$

where

G_e total effective green time (s)

g_{ej} each phase effective green time (s)

y_{cj} flow ratio of each phase

4. Signal intersection capacity and saturation

Road capacity represents the ability of road traffic facilities to handle traffic, the capacity of signal intersection is estimated according to each entrance lane of intersection. The capacity of an entrance lane can be calculated from Eqn. (8).

$$c = Ns\frac{g_e}{C} \tag{8}$$

where

c capacity of the intersection

5. LOS Calculations

The level of service (LOS) of signal intersection and traffic signal timing are determined according to the calculated average signal control delay. The delay of intersection is the evaluation index that reflects the obstruction and time loss of the vehicle at the signal intersection. The delay of each lane can be estimated by Eqn. (9), (10), (11), (12).

$$d = d_1 + d_2 + d_3 \tag{9}$$

$$d_1 = \frac{0.5C\left(1-g/C^2\right)}{1-\left[\min(1,X)\,g/C\right]} \tag{10}$$

$$d_2 = 900T\left[\left(X-1\right)+\sqrt{\left(X-1\right)^2+\frac{8eX}{cT}}\right] \tag{11}$$

$$X = \frac{v}{c} \tag{12}$$

where

d average delay per vehicle each lane (s)

d_1 uniform delay which caused by the uniform arrival of the vehicle (s)

d_2 additional delays caused by the arrival of the vehicle at random and causing the supersaturated cycles

d_3 initial queuing delay (s)

T analysis period duration (T =15min)

e signal control type correction factor (e=0.5)

Because this intersection needs to meet the LOS requirements, there should be no initial queuing at the beginning of the analysis and no initial queuing delay. Therefore, the value of d_3 is equal to 0.

Table B-1 Lanes, Volumes, Timings San Pedro Street & Santa Clara Street Intersection (AM Peak Hour)												
Approach	EB			WB			NB			SB		
Lane Configurations												
Lane Group	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	127	672	145	30	537	19	32	33	29	8	14	8
Future Volumes(2039)(vph)	189	1001	216	45	800	28	48	49	43	12	21	12
Peak Hour Factor	1											
Heavy Vehicles(%)	2											
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	1652	3214		3277			1639			1654		
Phase	1	6		5	2		4			8		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.43	0.67	0.67	0.53	0.53	0.53	0.35	0.35	0.35	0.11	0.11	0.11
Base Capacity(vph)	439	1806		1658			404			415		
Link Speed(mph)	30						25					
Right Turn on Red	Yes											
Total Delay(s)	9.7	16.8	16.8	5.5	5.5	5.5	27.0	27.0	27.0	22.2	22.2	22.2
LOS	A	B	B	A	A	A	C	C	C	C	C	C
Approach Delay(s)	15.9			5.5			27.0			22.2		
Approach LOS	B			A			C			C		
Calculated Cycle Length(s)	96											
Offset(s)	38											
Intersection Delay(s/veh)	13.0											
Intersection LOS	B											

Table B-2 Lanes, Volumes, Timings Market Street & Santa Clara Street Intersection (AM Peak Hour)												
Approach	EB			WB			NB			SB		
Lane Configurations												
Lane Group	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	141	527	140	87	458	152	121	846	47	58	278	45
Future Volumes(2039)(vph)	210	785	209	130	682	226	180	1261	70	86	414	67
Peak Hour Factor	1											
Heavy Vehicles(%)	2											
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	4581			4562			4685			4624		
Phase	1	6		5	2		7	4		3	8	
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.90	0.90	0.90	0.80	0.80	0.80	0.93	0.93	0.93	0.39	0.39	0.39
Base Capacity(vph)	1337			1298			1620			1451		
Link Speed(mph)	25											
Right Turn on Red	Yes											
Total Delay(s)	22.0	22.0	22.0	6.8	6.8	6.8	35.1	35.1	35.1	16.2	16.2	16.2
LOS	C	C	C	A	A	A	D	D	D	B	B	B
Approach Delay(s)	22.0			6.8			35.1			16.2		
Approach LOS	C			A			D			B		
Calculated Cycle Length(s)	96											
Offset(s)	42											
Intersection Delay(s/veh)	22.1											
Intersection LOS	C											

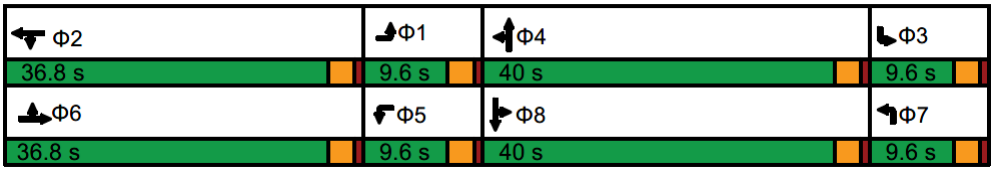


Table B-3 Lanes, Volumes, Timings First Street & Santa Clara Street Intersection (AM Peak Hour)							
Approach	EB		WB		NB		
Lane Configurations							
Lane Group	LT	TH	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	59	565	728	45	23	219	29
Future Volumes(2039)(vph)	88	842	1085	67	34	326	43
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	3287		3274		3237		
Phase	3	8	4		2		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.68	0.68	0.70	0.70	0.39	0.39	0.39
Base Capacity(vph)	1369		1641		1034		
Link Speed(mph)	25						
Right Turn on Red	Yes						
Total Delay(s)	10.5	10.5	7.1	7.1	26.0	26.0	26.0
LOS	B	B	A	A	C	C	C
Approach Delay(s)	10.5		7.1		26.0		
Approach LOS	B		A		C		
Calculated Cycle Length(s)	96						
Offset(s)	90						
Intersection Delay(s/veh)	11.5						
Intersection LOS	B						

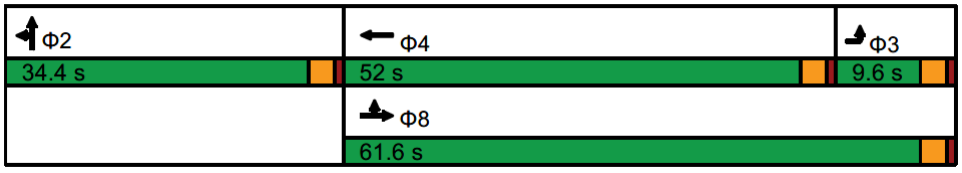


Table B-4 Lanes, Volumes, Timings Second Street & Santa Clara Street Intersection (AM Peak Hour)							
Approach	EB		WB		SB		
Lane Configurations							
Lane Group	TH	RT	LT	TH	LT	TH	RT
Traffic Volumes(2019)(vph)	496	98	56	780	20	142	26
Future Volumes(2039)(vph)	739	146	83	1162	30	212	39
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	3221		2573		3218		
Phase	8	7	4		2		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.56	0.56	0.76	0.76	0.29	0.29	0.29
Base Capacity(vph)	1573		1645		985		
Link Speed(mph)	25						
Right Turn on Red	Yes						
Total Delay(s)	24.6	24.6	19.4	19.4	24.7	24.7	24.7
LOS	C	C	B	B	C	C	C
Approach Delay(s)	24.6		19.4		24.7		
Approach LOS	C		B		C		
Calculated Cycle Length(s)	96						
Offset(s)	68						
Intersection Delay(s/veh)	22.0						
Intersection LOS	C						

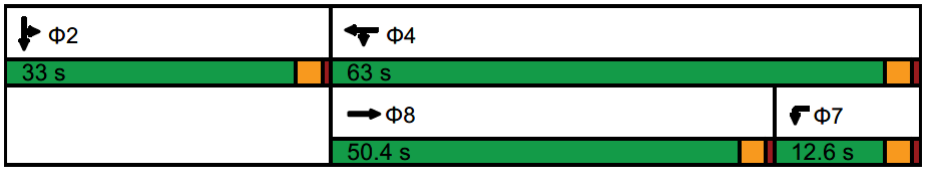


Table B-5 Lanes, Volumes, Timings Third Street & Santa Clara Street Intersection (AM Peak Hour)							
Approach	EB		WB		NB		
Lane Configurations							
Lane Group	LT	TH	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	143	386	581	85	106	865	151
Future Volumes(2039)(vph)	213	575	866	127	158	1289	225
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	4685		4656		4628		
Phase	2	1	1		3		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.45	0.45	0.74	0.74	0.86	0.86	0.86
Base Capacity(vph)	1736		1348		1949		
Link Speed(mph)	25				30		
Right Turn on Red	Yes						
Total Delay(s)	2.5	2.5	30.7	30.7	30.4	30.4	30.4
LOS	A	A	C	C	C	C	C
Approach Delay(s)	2.5		30.7		30.4		
Approach LOS	A		C		C		
Calculated Cycle Length(s)	96						
Offset(s)	14						
Intersection Delay(s/veh)	24.1						
Intersection LOS	C						

Table B-6 Lanes, Volumes, Timings Fourth Street & Santa Clara Street Intersection (AM Peak Hour)							
Approach	EB		WB		SB		
Lane Configurations							
Lane Group	TH	RT	LT	TH	LT	TH	RT
Traffic Volumes(2019)(vph)	372	120	127	543	42	295	80
Future Volumes(2039)(vph)	554	179	189	809	63	440	119
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	3181		1652	1739	4586		
Phase	6		5	2	8		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.55	0.55	0.52	0.70	0.52	0.52	0.52
Base Capacity(vph)	1324		361	1159	1187		
Link Speed(mph)	25				30		
Right Turn on Red	Yes						
Total Delay(s)	15.4	15.4	28.7	5.2	30.0	30.0	30.0
LOS	B	B	C	A	C	C	C
Approach Delay(s)	15.4		9.6		30.0		
Approach LOS	B		A		C		
Calculated Cycle Length(s)	96						
Offset(s)	2						
Intersection Delay(s/veh)	16.8						
Intersection LOS	B						

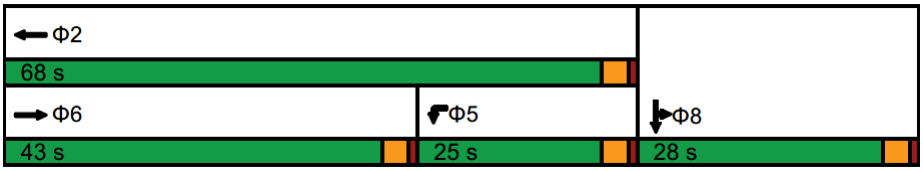


Table B-7 Lanes, Volumes, Timings Fifth Street & Santa Clara Street Intersection (AM Peak Hour)						
Approach	EB		WB		SB	
Lane Configurations						
Lane Group	LT	TH	TH	RT	LT	RT
Traffic Volumes(2019)(vph)	71	471	690	111	10	20
Future Volumes(2039)(vph)	106	702	1028	165	15	30
Peak Hour Factor	1					
Heavy Vehicles(%)	2					
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	3280		3234		1557	
Phase	6		2		8	
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.55	0.55	0.53	0.53	0.12	0.12
Base Capacity(vph)	1480		2270		364	
Link Speed(mph)	25					
Right Turn on Red	Yes					
Total Delay(s)	3.6	3.6	1.5	1.5	16.3	16.3
LOS	A	A	A	A	B	B
Approach Delay(s)	3.6		1.5		16.3	
Approach LOS	A		A		B	
Calculated Cycle Length(s)	96					
Offset(s)	84					
Intersection Delay(s/veh)	2.7					
Intersection LOS	A					

Table B-8 Lanes, Volumes, Timings Sixth Street & Santa Clara Street Intersection (AM Peak Hour)												
Approach	EB			WB			NB			SB		
Lane Configurations												
Lane Group	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	25	361	56	22	754	98	22	23	18	32	54	32
Future Volumes(2039)(vph)	37	538	83	33	1123	146	33	34	27	48	80	48
Peak Hour Factor	1											
Heavy Vehicles(%)	2											
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	1652	1704		1652	3247		1106	1624		1247	1641	
Phase	1	6		5	2		4			8		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.31	0.67	0.67	0.28	0.72	0.72	0.11	0.14	0.14	0.15	0.29	0.29
Base Capacity(vph)	120	928		120	1769		288	442		324	449	
Link Speed(mph)	25											
Right Turn on Red	Yes											
Total Delay(s)	38.0	12.7	12.7	48.3	19.1	19.1	28.5	18.4	18.4	28.9	23.5	23.5
LOS	D	B	B	D	B	B	C	B	B	C	C	C
Approach Delay(s)	14.1			19.8			21.9			25.0		
Approach LOS	B			B			C			C		
Calculated Cycle Length(s)	96											
Offset(s)	8											
Intersection Delay(s/veh)	18.6											
Intersection LOS	B											

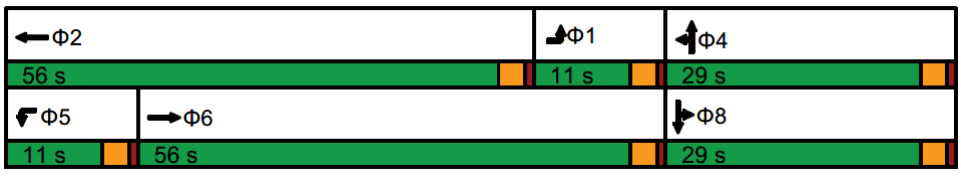


Table B-9 Lanes, Volumes, Timings San Pedro Street & Santa Clara Street Intersection (PM Peak Hour)												
Approach	EB			WB			NB			SB		
Lane Configurations												
Lane Group	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	177	769	58	29	584	74	50	19	18	19	40	86
Future Volumes(2039)(vph)	264	1146	86	43	870	110	75	28	27	28	60	128
Peak Hour Factor	1											
Heavy Vehicles(%)	2											
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	466	3270		3244			1643			1590		
Phase	1	6		5	2		4			8		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.57	0.62	0.62	0.63	0.63	0.63	0.49	0.49	0.49	0.52	0.52	0.52
Base Capacity(vph)	460	1983		1616			264			418		
Link Speed(mph)	30						25					
Right Turn on Red	Yes											
Total Delay(s)	12.2	16.4	16.4	10.7	10.7	10.7	42.2	42.2	42.2	32.6	32.6	32.6
LOS	B	B	B	B	B	B	D	D	D	C	C	C
Approach Delay(s)	15.7			10.7			42.2			32.6		
Approach LOS	B			B			D			C		
Calculated Cycle Length(s)	118											
Offset(s)	94											
Intersection Delay(s/veh)	16.4											
Intersection LOS	B											

Table B-10 Lanes, Volumes, Timings Market Street & Santa Clara Street Intersection (PM Peak Hour)												
Approach	EB			WB			NB			SB		
Lane Configurations												
Lane Group	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	74	621	74	105	413	70	68	227	57	139	779	136
Future Volumes(2039)(vph)	110	925	110	156	615	104	101	338	85	207	1161	203
Peak Hour Factor	1											
Heavy Vehicles(%)	2											
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	4656			4619			4586			4624		
Phase	1	6		5	2		7	4		3	8	
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.79	0.79	0.79	0.68	0.68	0.68	0.35	0.35	0.35	0.92	0.92	0.92
Base Capacity(vph)	1451			1291			1498			1713		
Link Speed(mph)	25											
Right Turn on Red	Yes											
Total Delay(s)	20.6	20.6	20.6	20.3	20.3	20.3	17.0	17.0	17.0	35.9	35.9	35.9
LOS	C	C	C	C	C	C	B	B	B	D	D	D
Approach Delay(s)	20.6			20.3			17.0			35.9		
Approach LOS	C			C			B			D		
Calculated Cycle Length(s)	118											
Offset(s)	107											
Intersection Delay(s/veh)	25.9											
Intersection LOS	C											

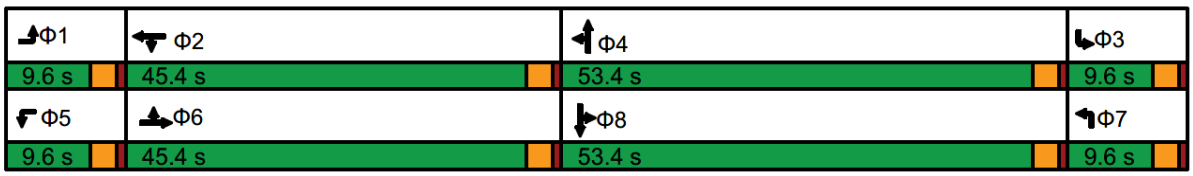


Table B-11 Lanes, Volumes, Timings First Street & Santa Clara Street Intersection (PM Peak Hour)							
Approach	EB		WB		NB		
Lane Configurations							
Lane Group	LT	TH	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	92	866	516	30	78	121	86
Future Volumes(2039)(vph)	137	1290	769	45	116	180	128
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	2335		3277		3114		
Phase	3	8	4		2		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.85	0.85	0.40	0.40	0.56	0.56	0.56
Base Capacity(vph)	1688		2039		753		
Link Speed(mph)	25						
Right Turn on Red	Yes						
Total Delay(s)	13.5	13.5	22.9	22.9	38.4	38.4	38.4
LOS	B	B	C	C	D	D	D
Approach Delay(s)	13.5		22.9		38.4		
Approach LOS	B		C		D		
Calculated Cycle Length(s)	118						
Offset(s)	50						
Intersection Delay(s/veh)	20.3						
Intersection LOS	C						

Table B-12 Lanes, Volumes, Timings Second Street & Santa Clara Street Intersection (PM Peak Hour)							
Approach	EB		WB		SB		
Lane Configurations							
Lane Group	TH	RT	LT	TH	LT	TH	RT
Traffic Volumes(2019)(vph)	757	85	83	495	83	278	54
Future Volumes(2039)(vph)	1128	127	124	738	124	414	80
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	3254		3280		3208		
Phase	8	7	4		2		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.72	0.72	0.68	0.68	0.66	0.66	0.66
Base Capacity(vph)	1755		1296		934		
Link Speed(mph)	25						
Right Turn on Red	Yes						
Total Delay(s)	15.2	15.2	8.8	8.8	40.5	40.5	40.5
LOS	B	B	A	A	D	D	D
Approach Delay(s)	15.2		8.8		40.5		
Approach LOS	B		A		D		
Calculated Cycle Length(s)	118						
Offset(s)	73						
Intersection Delay(s/veh)	18.9						
Intersection LOS	B						

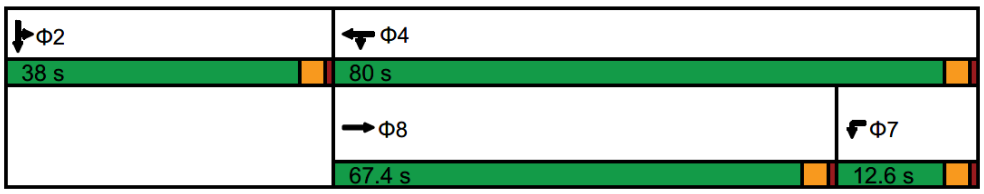


Table B-13 Lanes, Volumes, Timings Third Street & Santa Clara Street Intersection (PM Peak Hour)							
Approach	EB		WB		NB		
Lane Configurations							
Lane Group	LT	TH	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	75	742	529	68	98	374	124
Future Volumes(2039)(vph)	112	1106	788	101	146	557	185
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	4723		4666		4562		
Phase	2	1	1		3		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.56	0.56	0.43	0.43	0.59	0.59	0.59
Base Capacity(vph)	2173		2046		1509		
Link Speed(mph)	25				30		
Right Turn on Red	Yes						
Total Delay(s)	8.1	8.1	15.1	15.1	33.0	33.0	33.0
LOS	A	A	B	B	C	C	C
Approach Delay(s)	8.1		15.1		33.0		
Approach LOS	A		B		C		
Calculated Cycle Length(s)	118						
Offset(s)	8						
Intersection Delay(s/veh)	17.6						
Intersection LOS	B						

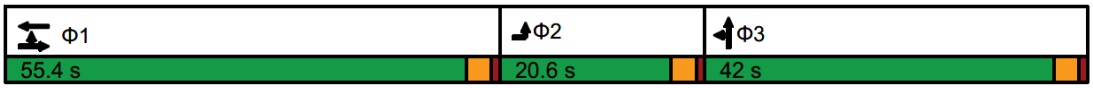


Table B-14 Lanes, Volumes, Timings Fourth Street & Santa Clara Street Intersection (PM Peak Hour)							
Approach	EB		WB		SB		
Lane Configurations							
Lane Group	TH	RT	LT	TH	LT	TH	RT
Traffic Volumes(2019)(vph)	638	220	170	431	100	759	101
Future Volumes(2039)(vph)	951	328	253	642	149	1131	150
Peak Hour Factor	1						
Heavy Vehicles(%)	2						
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	3178		134	1739	4647		
Phase	6		5	2	8		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.90	0.90	0.94	0.61	0.92	0.92	0.92
Base Capacity(vph)	1426		269	1046	1547		
Link Speed(mph)	25				30		
Right Turn on Red	Yes						
Total Delay(s)	21.4	21.4	78.4	12.0	48.7	48.7	48.7
LOS	C	C	E	B	D	D	D
Approach Delay(s)	21.4		30.7		48.7		
Approach LOS	C		C		D		
Calculated Cycle Length(s)	118						
Offset(s)	8						
Intersection Delay(s/veh)	34.6						
Intersection LOS	C						

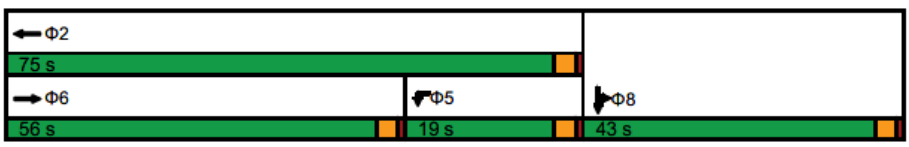


Table B-15 Lanes, Volumes, Timings Fifth Street & Santa Clara Street Intersection (PM Peak Hour)						
Approach	EB		WB		SB	
Lane Configurations						
Lane Group	LT	TH	TH	RT	LT	RT
Traffic Volumes(2019)(vph)	43	771	544	49	59	60
Future Volumes(2039)(vph)	64	1149	811	73	88	89
Peak Hour Factor	1					
Heavy Vehicles(%)	2					
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	2755		3264		1581	
Phase	6		2		8	
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.62	0.62	0.38	0.38	0.47	0.47
Base Capacity(vph)	1961		2329		379	
Link Speed(mph)	25					
Right Turn on Red	Yes					
Total Delay(s)	4.1	4.1	1.6	1.6	35.3	35.3
LOS	A	A	A	A	D	D
Approach Delay(s)	4.1		1.6		35.2	
Approach LOS	A		A		D	
Calculated Cycle Length(s)	118					
Offset(s)	2					
Intersection Delay(s/veh)	5.6					
Intersection LOS	A					

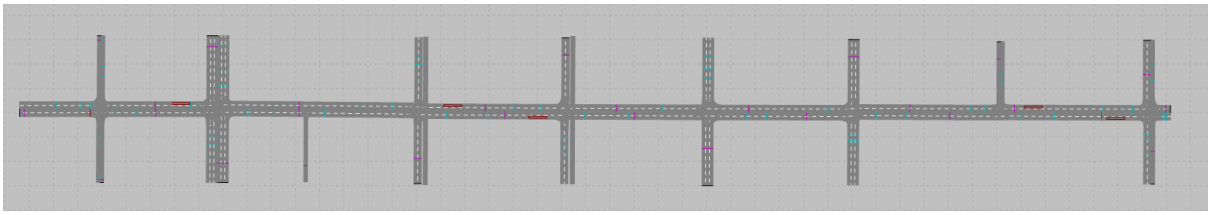
Table B-16 Lanes, Volumes, Timings Sixth Street & Santa Clara Street Intersection (PM Peak Hour)												
Approach	EB			WB			NB			SB		
Lane Configurations												
Lane Group	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Traffic Volumes(2019)(vph)	27	782	54	12	523	37	55	41	32	41	29	35
Future Volumes(2039)(vph)	40	1165	80	18	779	55	82	61	48	61	43	52
Peak Hour Factor	1											
Heavy Vehicles(%)	2											
Ideal Flow(vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Saturation Flow Rate(vph/h)	1652	1721		1652	3270		1652	1624		1652	1596	
Phase	1	6		5	2		4			8		
Yellow Time(s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time(s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time(s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
v/c Ratio	0.16	0.96	0.96	0.29	0.40	0.40	0.72	0.54	0.54	0.59	0.45	0.45
Base Capacity(vph)	245	1300		63	2110		114	202		103	212	
Link Speed(mph)	25											
Right Turn on Red	Yes											
Total Delay(s)	41.3	27.5	27.5	66.8	10.5	10.5	84.2	47.8	47.8	74.0	36.5	36.5
LOS	D	C	C	E	B	B	F	D	D	E	D	D
Approach Delay(s)	27.9			11.7			63.4			51.1		
Approach LOS	C			B			E			D		
Calculated Cycle Length(s)	118											
Offset(s)	9											
Intersection Delay(s/veh)	26.6											
Intersection LOS	C											

PTV Vissim 10.00-02 student version is chosen for re-checking signal timing.

Basic parameters used in the simulation model are listed below:

- Heavy traffic Rate: 2% (According to the *Synchro* results)
- Speed Limits: 25mph for Santa Clara St, 1st, 2nd, 5th, 6th, Market St and 30mph for 3rd and 4th St.
- Bus Frequency: Every 12 minutes.

Vissim model is shown below.



LOS Hand Calculation

$$d = d_1 + d_2 + d_3 = \frac{0.5C(1-\frac{g}{C})^2}{1-[\min(1,x)g/C]} + 900T\left[(X-1)+\sqrt{(X-1)^2+\frac{8eX}{cT}}\right]$$

$c = \frac{gs}{C}$

$X = \frac{v}{c}$

$e = 0.5$

$T = 0.25h$

where

d= average delay per vehicle each lane(s)

C = cycle length (s)

g = effective green time (s)

c = capacity (veh/h)

T = Analysis period duration (T=0.25h)

e = signal control correction factor (e=0.5)

v= arrival rate (veh/h)

s= adjusted saturation flow rate (veh/h)

AM

1. SAN PEDRO STREET & SANTA CLARA STREET INTERSECTION

Eastbound Left Turn

C=96s

g= 11.3 s

v = 189 veh/h

s = 3214 veh/h

$c = \frac{gs}{C} = \frac{11.3 \times 3214}{96} = 378.31$ veh/h

$X = \frac{v}{C} = \frac{189}{378.31} = 0.50$

$d = \frac{0.5 \times 96 \times (1-\frac{11.3}{96})^2}{1-(0.5 \times 11.3/96)} + 900 \times 0.25 \times \left[(0.50-1)+\sqrt{(0.50-1)^2+\frac{8 \times 0.5 \times 0.50}{378.31 \times 0.25}}\right] = 44.35s$

East bound Throughway

$C = 96s$

$g = 57.4\ s$

$v = 1001\ veh/h$

$S = 3214\ veh/h$

$$c = \frac{gS}{C} = \frac{57.4 \times 3214}{96} = 1921.70\ veh/h$$

$$X = \frac{v}{c} = \frac{1001}{1921.70} = 0.52$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{57.4}{96})^2}{1 - 0.52 \times 57.4/96} + 900 \times 0.25 \times \left[(0.52 - 1) + \sqrt{(0.52-1)^2 + \frac{8 \times 0.5 \times 0.52}{1921.70 \times 0.25}} \right] = 12.28\ s$$

East bound Right Turn

$C = 96s$

$g = 57.4\ s$

$v = 216\ veh/h$

$S = 3214\ veh/h$

$$c = \frac{gS}{C} = \frac{57.4 \times 3214}{96} = 1921.70\ veh/h$$

$$X = \frac{v}{c} = \frac{216}{1921.70} = 0.11$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{57.4}{96})^2}{1 - 0.11 \times 57.4/96} + 900 \times 0.25 \times \left[(0.11 - 1) + \sqrt{(0.11-1)^2 + \frac{8 \times 0.5 \times 0.11}{1921.70 \times 0.25}} \right] = 8.44s$$

West bound Left Turn

$C = 96s$

$g = 9.6\ s$

$v = 45\ veh/h$

$S = 2721\ veh/h$

$$c = \frac{gS}{C} = \frac{9.6 \times 2721}{96} = 272.1\ veh/h$$

$$X = \frac{v}{c} = \frac{45}{272.1} = 0.17$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{9.6}{96})^2}{1 - 0.17 \times 9.6/96} + 900 \times 0.25 \times \left[(0.17 - 1) + \sqrt{(0.17-1)^2 + \frac{8 \times 0.5 \times 0.17}{272.1 \times 0.25}} \right] = 40.84s$$

Westbound Throughway

$C = 96s$

$g = 55.7s$

$v = 800$ veh/h

$S = 2721$ veh/h

$c = \frac{gS}{C} = \frac{55.7 \times 2721}{96} = 1578.747$ veh/h

$X = \frac{V}{C} = \frac{800}{1578.747} = 0.51$

$$d = \frac{0.5 \times 96 \times (1 - \frac{55.7}{96})^2}{1 - 0.51 \times 55.7/96} + 900 \times 0.25 \times \left[(0.51 - 1) + \sqrt{(0.51-1)^2 + \frac{8 \times 0.5 \times 0.51}{1578.747 \times 0.25}} \right] = 13.15\ s$$

Westbound Right Turn

$C = 96s$

$g = 55.7s$

$v = 28$ veh/h

$S = 2721$ veh/h

$c = \frac{gS}{C} = \frac{55.7 \times 2721}{96} = 1578.75$ veh/h

$X = \frac{V}{C} = \frac{28}{1578.75} = 0.02$

$$d = \frac{0.5 \times 96 \times (1 - \frac{55.7}{96})^2}{1 - 0.02 \times 55.7/96} + 900 \times 0.25 \times \left[(0.02 - 1) + \sqrt{(0.02-1)^2 + \frac{8 \times 0.5 \times 0.02}{1578.75 \times 0.25}} \right] = 8.57s$$

Northbound Left Turn

$C = 96s$

$g = 29s$

$v = 48$ veh/h

$S = 1492$ veh/h

$c = \frac{gS}{C} = \frac{29 \times 1492}{96} = 450.71$ veh/h

$X = \frac{V}{C} = \frac{48}{450.71} = 0.11$

$$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.11 \times 29/96} + 900 \times 0.25 \times \left[(0.11 - 1) + \sqrt{(0.11-1)^2 + \frac{8 \times 0.5 \times 0.11}{450.71 \times 0.25}} \right] = 24.63\ s$$

Northbound Throughway

$C = 96s$

$g = 29s$

$v = 49$ veh/h

$S = 1492$ veh/h

$c = \frac{gS}{C} = \frac{29 \times 1492}{96} = 450.71$ veh/h

$X = \frac{v}{c} = \frac{49}{450.71} = 0.11$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.11 \times 29/96} + 900 \times 0.25 \times \left[(0.11 - 1) + \sqrt{(0.11-1)^2 + \frac{8 \times 0.5 \times 0.11}{450.71 \times 0.25}} \right] = 24.66\,s$

Northbound Right Turn

$C = 96s$

$g = 29s$

$v = 43$ veh/h

$S = 1492$ veh/h

$c = \frac{gS}{C} = \frac{29 \times 1492}{96} = 450.71$ veh/h

$X = \frac{v}{c} = \frac{43}{450.71} = 0.10$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.1 \times 29/96} + 900 \times 0.25 \times \left[(0.1 - 1) + \sqrt{(0.1-1)^2 + \frac{8 \times 0.5 \times 0.1}{450.71 \times 0.25}} \right] = 24.50\,s$

Southbound Left Turn

$C = 96s$

$g = 29s$

$v = 12$ veh/h

$S = 1560$ veh/h

$c = \frac{gS}{C} = \frac{29 \times 1560}{96} = 471.25$ veh/h

$X = \frac{v}{c} = \frac{12}{471.25} = 0.03$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.03 \times 29/96} + 900 \times 0.25 \times \left[(0.03 - 1) + \sqrt{(0.03-1)^2 + \frac{8 \times 0.5 \times 0.03}{471.25 \times 0.25}} \right] = 23.66\,s$

Southbound Throughway

$C = 96s$

$g = 29s$

$v = 21\ veh/h$

$S = 1560\ veh/h$

$c = \frac{gS}{C} = \frac{29 \times 1560}{96} = 471.25\ veh/h$

$X = \frac{v}{c} = \frac{21}{471.25} = 0.04$

$$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.04 \times 29/96} + 900 \times 0.25 \times \left[(0.04 - 1) + \sqrt{(0.04-1)^2 + \frac{8 \times 0.5 \times 0.04}{471.25 \times 0.25}} \right] = 23.88\ s$$

Southbound Right Turn

$C = 96s$

$g = 29s$

$v = 12\ veh/h$

$S = 1560\ veh/h$

$c = \frac{gS}{C} = \frac{29 \times 1560}{96} = 471.25\ veh/h$

$X = \frac{v}{c} = \frac{12}{471.25} = 0.03$

$$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.03 \times 29/96} + 900 \times 0.25 \times \left[(0.03 - 1) + \sqrt{(0.03-1)^2 + \frac{8 \times 0.5 \times 0.03}{471.25 \times 0.25}} \right] = 23.66s$$

2. NORTH MARKET STREET & SANTA CLARA STREET INTERSECTION

Eastbound Left Turn

$C = 96s$

$g = 9.6s$

$v = 210\ veh/h$

$S = 3033\ veh/h$

$c = \frac{gS}{C} = \frac{9.6 \times 3033}{96} = 303.3\ veh/h$

$X = \frac{v}{c} = \frac{210}{303.3} = 0.69$

$$d = \frac{0.5 \times 96 \times (1 - \frac{9.6}{96})^2}{1 - 0.69 \times 9.6/96} + 900 \times 0.25 \times \left[(0.69 - 1) + \sqrt{(0.69-1)^2 + \frac{8 \times 0.5 \times 0.69}{303.3 \times 0.25}} \right] = 54.04\ s$$

East bound Throughway

$C = 96\,s$

$g = 36.8\,s$

$v = 785\ veh/h$

$S = 3033\ veh/h$

$c = \frac{gS}{C} = \frac{36.8 \times 3033}{96} = 1162.65\ veh/h$

$x = \frac{v}{c} = \frac{785}{1162.65} = 0.68$

$$d = \frac{0.5 \times 96 \times (1 - \frac{36.8}{96})^2}{1 - 0.68 \times 36.8/96} + 900 \times 0.25 \times \left[(0.68 - 1) + \sqrt{(0.68-1)^2 + \frac{8 \times 0.5 \times 0.68}{1162.65 \times 0.25}} \right] = 27.78\,s$$

East bound Right ~~Left~~ Turn

$C = 96\,s$

$g = 36.8\,s$

$v = 209\ veh/h$

$S = 3033\ veh/h$

$c = \frac{gS}{C} = \frac{36.8 \times 3033}{96} = 1162.65\ veh/h$

$x = \frac{v}{c} = \frac{209}{1162.65} = 0.18$

$$d = \frac{0.5 \times 96 \times (1 - \frac{36.8}{96})^2}{1 - 0.18 \times 36.8/96} + 900 \times 0.25 \times \left[(0.18 - 1) + \sqrt{(0.18-1)^2 + \frac{8 \times 0.5 \times 0.18}{1162.65 \times 0.25}} \right] = 19.94\,s$$

Westbound Left Turn

$C = 96\,s$

$g = 9.6\,s$

$v = 130\ veh/h$

$S = 2983\ veh/h$

$c = \frac{gS}{C} = \frac{9.6 \times 2983}{96} = 298.3\ veh/h$

$x = \frac{v}{c} = \frac{130}{298.3} = 0.44$

$$d = \frac{0.5 \times 96 \times (1 - \frac{9.6}{96})^2}{1 - 0.44 \times 9.6/96} + 900 \times 0.25 \times \left[(0.44 - 1) + \sqrt{(0.44-1)^2 + \frac{8 \times 0.5 \times 0.44}{2983 \times 0.25}} \right] = 45.23\,s$$

Westbound Through way

$C = 96s$

$g = 36.8\ s$

$v = 682\ veh/h$

$S = 2982\ veh/h$

$c = \frac{gS}{C} = \frac{36.8 \times 2982}{96} = 1143.48\ veh/h$

$X = \frac{v}{c} = \frac{682}{1143.48} = 0.60$

$$d = \frac{0.5 \times 96 \times (1 - \frac{36.8}{96})^2}{1 - 0.6 \times 36.8/96} + 900 \times 0.25 \times \left[(0.6 - 1) + \sqrt{(0.6-1)^2 + \frac{8 \times 0.5 \times 0.60}{1143.48 \times 0.25}} \right] = 25.96\ s$$

Westbound Right Turn

$C = 96s$

$g = 36.8\ s$

$v = 232\ veh/h$

$S = 2983\ veh/h$

$c = \frac{gS}{C} = \frac{36.8 \times 2983}{96} = 1143.48\ veh/h$

$X = \frac{v}{c} = \frac{232}{1143.48} = 0.20$

$$d = \frac{0.5 \times 96 \times (1 - \frac{36.8}{96})^2}{1 - 0.2 \times 36.8/96} + 900 \times 0.25 \times \left[(0.20 - 1) + \sqrt{(0.20-1)^2 + \frac{8 \times 0.5 \times 0.20}{1143.48 \times 0.25}} \right] = 20.19\ s$$

Northbound Left Turn

$C = 96s$

$g = 9.6s$

$v = 180\ veh/h$

$S = 3577\ veh/h$

$c = \frac{gS}{C} = \frac{9.6 \times 3577}{96} = 357.7\ veh/h$

$X = \frac{v}{c} = \frac{180}{357.7} = 0.50$

$$d = \frac{0.5 \times 96 \times (1 - \frac{9.6}{96})^2}{1 - 0.5 \times 9.6/96} + 900 \times 0.25 \times \left[(0.50 - 1) + \sqrt{(0.50-1)^2 + \frac{8 \times 0.5 \times 0.50}{357.7 \times 0.25}} \right] = 45.93\ s$$

Northbound Left Turn

$C = 96\,s$

$g = 9.6\,s$

$V = 180\ veh/h$

$S = 3577\ veh/h$

$c = \frac{gS}{C} = \frac{9.6 \times 3577}{96} = 357.7\ veh/h$

$X = \frac{V}{c} = \frac{180}{357.7} = 0.50$

$d = \frac{0.5 \times 96 \times (1 - \frac{9.6}{96})^2}{1 - 0.5 \times 9.6/96} + 900 \times 0.25 \times \left[(0.50 - 1) + \sqrt{(0.50-1)^2 + \frac{8 \times 0.5 \times 0.50}{357.7 \times 0.25}} \right] = 45.93\,s$

Northbound Throughway

$C = 96\,s$

$g = 40\,s$

$V = 1261\ veh/h$

$S = 3577\ veh/h$

$c = \frac{gS}{C} = \frac{40 \times 3577}{96} = 1490.42\ veh/h$

$X = \frac{V}{c} = \frac{1261}{1490.42} = 0.85$

$d = \frac{0.5 \times 96 \times (1 - \frac{40}{96})^2}{1 - 0.85 \times 40/96} + 900 \times 0.25 \times \left[(0.85 - 1) + \sqrt{(0.85-1)^2 + \frac{8 \times 0.5 \times 0.85}{1490.42 \times 0.25}} \right] = 31.33\,s$

Northbound Right Turn

$C = 96\,s$

$g = 40\,s$

$V = 70\ veh/h$

$S = 3577\ veh/h$

$c = \frac{gS}{C} = \frac{40 \times 3577}{96} = 1490.42\ veh/h$

$X = \frac{V}{c} = \frac{70}{1490.42} = 0.05$

$d = \frac{0.5 \times 96 \times (1 - \frac{40}{96})^2}{1 - 0.05 \times 40/96} + 900 \times 0.25 \times \left[(0.05 - 1) + \sqrt{(0.05-1)^2 + \frac{8 \times 0.5 \times 0.05}{1490.42 \times 0.25}} \right] = 16.72\,s$

Southbound Left Turn

$C = 96\,s$

$g = 9.6\,s$

$v = 86\ veh/h$

$S = 3104\ veh/h$

$c = \frac{gS}{C} = \frac{9.6 \times 3104}{96} = 310.4\ veh/h$

$X = \frac{v}{c} = \frac{86}{310.4} = 0.28$

$d = \frac{0.5 \times 96 \times (1 - \frac{9.6}{96})^2}{1 - 0.28 \times 9.6/96} + 900 \times 0.25 \times \left[(0.28 - 1) + \sqrt{(0.28-1)^2 + \frac{8 \times 0.5 \times 0.28}{310.4 \times 0.25}} \right] = 42.20\,s$

Southbound Throughway

$C = 96\,s$

$g = 40\,s$

$v = 414\ veh/h$

$S = 3104\ veh/h$

$c = \frac{gS}{C} = \frac{40 \times 3104}{96} = 1293.33\ veh/h$

$X = \frac{v}{c} = \frac{414}{1293.33} = 0.32$

$d = \frac{0.5 \times 96 \times (1 - \frac{40}{96})^2}{1 - 0.32 \times 40/96} + 900 \times 0.25 \times \left[(0.32 - 1) + \sqrt{(0.32-1)^2 + \frac{8 \times 0.5 \times 0.32}{1293.33 \times 0.25}} \right] = 19.50\,s$

Southbound Right Turn

$C = 96\,s$

$g = 40\,s$

$v = 67\ veh/h$

$S = 3104\ veh/h$

$c = \frac{gS}{C} = \frac{40 \times 3104}{96} = 1293.33\ veh/h$

$X = \frac{v}{c} = \frac{67}{1293.33} = 0.05$

$d = \frac{0.5 \times 96 \times (1 - \frac{40}{96})^2}{1 - 0.05 \times 40/91} + 900 \times 0.25 \times \left[(0.05 - 1) + \sqrt{(0.05-1)^2 + \frac{8 \times 0.5 \times 0.05}{1293.33 \times 0.25}} \right] = 16.77\,s$

3. NORTH 1ST STREET & SANTA CLARA STREET INTERSECTION

Eastbound Left Turn

$C=96s$

$g=9.6s$

$v=88$ veh/h

$S=3287$ veh/h

$c=\frac{gS}{C}=\frac{9.6\times3287}{96}=328.70$ veh/h

$X=\frac{v}{c}=\frac{88}{328.70}=0.27$

$d=\frac{0.5\times96\times(1-\frac{9.6}{96})^2}{1-0.27\times9.6/96}+900\times0.25\times\left[(0.27-1)+\sqrt{(0.27-1)^2+\frac{8\times0.5\times0.27}{328.70\times0.25}}\right]=41.74s$

Eastbound Throughway

$C=96s$

$g=61.6s$

$v=842$ veh/h

$S=3287$ veh/h

$c=\frac{gS}{C}=\frac{61.6\times3287}{96}=2109.16$ veh/h

$X=\frac{v}{c}=\frac{842}{2109.16}=0.40$

$d=\frac{0.5\times96\times(1-\frac{61.6}{96})^2}{1-0.4\times61.6/96}+900\times0.25\times\left[(0.40-1)+\sqrt{(0.40-1)^2+\frac{8\times0.5\times0.40}{2109.16\times0.25}}\right]=8.85s$

Westbound Throughway

$C=96s$

$g=48s$

$v=1085$ veh/h

$S=3274$ veh/h

$c=\frac{gS}{C}=\frac{48\times3274}{96}=1637$ veh/h

$X=\frac{v}{c}=\frac{1085}{1637}=0.66$

$d=\frac{0.5\times96\times(1-\frac{48}{96})^2}{1-0.66\times48/96}+900\times0.25\times\left[(0.66-1)+\sqrt{(0.66-1)^2+\frac{8\times0.5\times0.66}{1637\times0.25}}\right]=20.08s$

Westbound Right Turn

$C=96s$

$g=48s$

$v=67\ veh/h$

$S=3274\ veh/h$

$c=\frac{gS}{C}=\frac{48\times3274}{96}=1637\ veh/h$

$X=\frac{v}{c}=\frac{67}{1637}=0.04$

$d=\frac{0.5\times96\times(1-\frac{48}{96})^2}{1-0.04\times48/96}+900\times0.25\times\left[(0.04-1)+\sqrt{(0.04-1)^2+\frac{8\times0.5\times0.04}{1637\times0.25}}\right]=12.30s$

Northbound Left Turn

$C=96s$

$g=34.4s$

$v=34\ veh/h$

$S=3237\ veh/h$

$c=\frac{gS}{C}=\frac{34.4\times3237}{96}=1159.93\ veh/h$

$X=\frac{v}{c}=\frac{34}{1159.93}=0.03$

$d=\frac{0.5\times96\times(1-\frac{34.4}{96})^2}{1-0.03\times34.4/96}+900\times0.25\times\left[(0.03-1)+\sqrt{(0.03-1)^2+\frac{8\times0.5\times0.03}{1159.93\times0.25}}\right]=20.02s$

Northbound Throughway

$C=96s$

$g=34.4s$

$v=326\ veh/h$

$S=3237\ veh/h$

$c=\frac{gS}{C}=\frac{34.4\times3237}{96}=1159.93\ veh/h$

$X=\frac{v}{C}=\frac{326}{1159.93}=0.28$

$d=\frac{0.5\times96\times(1-\frac{34.4}{96})^2}{1-0.28\times34.4/96}+900\times0.25\times\left[(0.28-1)+\sqrt{(0.28-1)^2+\frac{8\times0.5\times0.28}{1159.93\times0.25}}\right]=22.58s$

Northbound Right Turn

$C = 96s$

$g = 34.4s$

$v = 43\ veh/h$

$S = 3237\ veh/h$

$c = \frac{gS}{C} = \frac{34.4 \times 3237}{96} = 1159.93\ veh/h$

$x = \frac{v}{c} = \frac{43}{1159.93} = 0.04$

$d = \frac{0.5 \times 96 \times (1 - \frac{34.4}{96})^2}{1 - 0.04 \times 34.4/96} + 900 \times 0.25 \times \left[(0.04 - 1) + \sqrt{(1 - 0.04)^2 + \frac{8 \times 0.5 \times 0.04}{1159.93 \times 0.25}} \right] = 20.09\ s$

4. NORTH 2ND STREET & SANTA CLARA STREET INTERSECTION

Eastbound Throughway

$C = 96s$

$g = 50.4s$

$v = 739\ veh/h$

$S = 3221\ veh/h$

$c = \frac{gS}{C} = \frac{50.4 \times 3221}{96} = 1691.03\ veh/h$

$x = \frac{v}{c} = \frac{739}{1691.03} = 0.44$

$d = \frac{0.5 \times 96 \times (1 - \frac{50.4}{96})^2}{1 - 0.44 \times 50.4/96} + 900 \times 0.25 \times \left[(0.44 - 1) + \sqrt{(0.44 - 1)^2 + \frac{8 \times 0.5 \times 0.44}{1691.03 \times 0.25}} \right] = 14.88\ s$

Eastbound Right Turn

$C = 96s$

$g = 50.4s$

$v = 146\ veh/h$

$S = 3221\ veh/h$

$c = \frac{gS}{C} = \frac{50.4 \times 3221}{96} = 1691.03\ veh/h$

$x = \frac{v}{c} = \frac{146}{1691.03} = 0.09$

$d = \frac{0.5 \times 96 \times (1 - \frac{50.4}{96})^2}{1 - 0.09 \times 50.4/96} + 900 \times 0.25 \times \left[(0.09 - 1) + \sqrt{(0.09 - 1)^2 + \frac{8 \times 0.5 \times 0.09}{1691.03 \times 0.25}} \right] = 11.44\ s$

Westbound Left Turn

$C = 96s$

$g = 12.6\,s$

$v = 83\ veh/h$

$S = 3293\ veh/h$

$$c = \frac{gS}{C} = \frac{12.6 \times 3293}{96} = 432.21\ veh/h$$

$$X = \frac{v}{c} = \frac{83}{432.21} = 0.2$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{12.6}{96})^2}{1 - 0.2 \times 12.6/96} + 900 \times 0.25 \times \left[(0.2-1) + \sqrt{(0.2-1)^2 + \frac{8 \times 0.5 \times 0.2}{432.21 \times 0.25}} \right] = 38.15\,s$$

Westbound Throughway

$C = 96s$

$g = 63\,s$

$v = 1162\ veh/h$

$S = 3293\ veh/h$

$$c = \frac{gS}{C} = \frac{63 \times 3293}{96} = 2161.03\ veh/h$$

$$X = \frac{v}{c} = \frac{1162}{2161.03} = 0.54$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{63}{96})^2}{1 - 0.54 \times 63/96} + 900 \times 0.25 \times \left[(0.54-1) + \sqrt{(0.54-1)^2 + \frac{8 \times 0.5 \times 0.54}{2161.03 \times 0.25}} \right] = 9.73\,s$$

Southbound Left Turn

$C = 96s$

$g = 31.6\,s$

$v = 30\ veh/h$

$S = 3218\ veh/h$

$$c = \frac{gS}{C} = \frac{31.6 \times 3218}{96} = 1059.26\ veh/h$$

$$X = \frac{v}{c} = \frac{30}{1059.26} = 0.03$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{31.6}{96})^2}{1 - 0.03 \times 31.6/96} + 900 \times 0.25 \times \left[(0.03-1) + \sqrt{(0.03-1)^2 + \frac{8 \times 0.5 \times 0.03}{1059.26 \times 0.25}} \right] = 21.85\,s$$

Southbound Throughway

$C = 96s$

$g = 31.6\ s$

$v = 212\ veh/h$

$S = 3218\ veh/h$

$c = \frac{gS}{C} = \frac{31.6 \times 3218}{96} = 1059.26\ veh/h$

$X = \frac{v}{C} = \frac{212}{1059.26} = 0.20$

$d = \frac{0.5 \times 96 \times (1 - \frac{31.6}{96})^2}{1 - 0.20 \times 31.6/96} + 900 \times 0.25 \times [(0.20-1) + \sqrt{(0.20-1)^2 + \frac{8 \times 0.5 \times 0.20}{1059.26 \times 0.25}}] = 23.55\ s$

Southbound Right Turn

$C = 96s$

$g = 31.6\ s$

$v = 39\ veh/h$

$S = 3218\ veh/h$

$c = \frac{gS}{C} = \frac{31.6 \times 3218}{96} = 1059.26\ veh/h$

$X = \frac{v}{C} = \frac{39}{1059.26} = 0.04$

$d = \frac{0.5 \times 96 \times (1 - \frac{31.6}{96})^2}{1 - 0.04 \times 31.6/96} + 900 \times 0.25 \times [(0.04-1) + \sqrt{(0.04-1)^2 + \frac{8 \times 0.5 \times 0.04}{1059.26 \times 0.25}}] = 21.93\ s$

5. NORTH 3RD STREET & SANTA CLARA STREET INTERSECTION

Eastbound Left Turn

$C = 96s$

$g = 20.6\ s$

$v = 213\ veh/h$

$S = 3246\ veh/h$

$c = \frac{gS}{C} = \frac{20.6 \times 3246}{96} = 696.54\ veh/h$

$X = \frac{v}{C} = \frac{213}{696.54} = 0.31$

$d = \frac{0.5 \times 96 \times (1 - \frac{20.6}{96})^2}{\quad} + 900 \times 0.25 \times [(0.31-1) + \sqrt{\quad + \frac{8 \times 0.5 \times 0.31}{\quad}}] = 32.82\ s$

Eastbound Throughway

$C = 96s$

$g = 31.4s$

$v = 575$ veh/h

$S = 3246$ veh/h

$c = \frac{gS}{C} = \frac{31.4 \times 3246}{96} = 1061.71$ veh/h

$X = \frac{v}{C} = \frac{575}{1061.71} = 0.54$

$d = \frac{0.5 \times 96 \times (1 - \frac{31.4}{96})^2}{1 - 0.54 \times 31.4/96} + 900 \times 0.25 \times [(0.54 - 1) + \sqrt{(0.54-1)^2 + \frac{8 \times 0.5 \times 0.54}{1061.71 \times 0.25}}] = 28.40s$

Westbound Throughway

$C = 96s$

$g = 31.4s$

$v = 866$ veh/h

$S = 4656$ veh/h

$c = \frac{gS}{C} = \frac{31.4 \times 4656}{96} = 1522.90$ veh/h

$X = \frac{v}{C} = \frac{866}{1522.90} = 0.57$

$d = \frac{0.5 \times 96 \times (1 - \frac{31.4}{96})^2}{1 - 0.57 \times 31.4/96} + 900 \times 0.25 \times [(0.57 - 1) + \sqrt{(0.57-1)^2 + \frac{8 \times 0.5 \times 0.57}{1522.90 \times 0.25}}] = 28.25s$

Westbound Right Turn

$C = 96s$

$g = 31.4s$

$v = 127$ veh/h

$S = 4656$ veh/h

$c = \frac{gS}{C} = \frac{31.4 \times 4656}{96} = 1522.90$ veh/h

$X = \frac{v}{C} = \frac{127}{1522.90} = 0.08$

$d = \frac{0.5 \times 96 \times (1 - \frac{31.4}{96})^2}{1 - 0.08 \times 31.4/96} + 900 \times 0.25 \times [(0.08 - 1) + \sqrt{(0.08-1)^2 + \frac{8 \times 0.5 \times 0.08}{1522.90 \times 0.25}}] = 22.45s$

Northbound Left Turn

$C = 96s$

$g = 44s$

$v = 158$ veh/h

$S = 4628$ veh/h

$c = \frac{gS}{C} = \frac{44 \times 4628}{96} = 2121.17$ veh/h

$X = \frac{v}{C} = \frac{158}{2121.17} = 0.07$

$d = \frac{0.5 \times 96 \times (1 - \frac{44}{96})^2}{1 - 0.07 \times 44/96} + 900 \times 0.25 \times [(0.07 - 1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.5 \times 0.07}{2121.17 \times 0.25}}] = 14.65s$

Northbound Throughway

$C = 96s$

$g = 44s$

$v = 1289$ veh/h

$S = 4628$ veh/h

$c = \frac{gS}{C} = \frac{44 \times 4628}{96} = 2121.167$ veh/h

$X = \frac{v}{C} = \frac{1289}{2121.167} = 0.61$

$d = \frac{0.5 \times 96 \times (1 - \frac{44}{96})^2}{1 - 0.61 \times 44/96} + 900 \times 0.25 \times [(0.61 - 1) + \sqrt{(0.61-1)^2 + \frac{8 \times 0.5 \times 0.61}{2121.167 \times 0.25}}] = 20.82s$

Northbound Right Turn

$C = 96s$

$g = 44s$

$v = 225$ veh/h

$S = 4628$ veh/h

$c = \frac{gS}{C} = \frac{44 \times 4628}{96} = 2121.17$ veh/h

$X = \frac{v}{C} = \frac{225}{2121.17} = 0.11$

$d = \frac{0.5 \times 96 \times (1 - \frac{44}{96})^2}{1 - 0.11 \times 44/96} + 900 \times 0.25 \times [(0.11 - 1) + \sqrt{(0.11-1)^2 + \frac{8 \times 0.5 \times 0.11}{2121.17 \times 0.25}}] = 14.96s$

6. NORTH 4TH STREET & SANTA CLARA STREET INTERSECTION

Eastbound Throughway

$C = 96s$

$g = 43s$

$v = 554\ veh/h$

$S = 3181\ veh/h$

$$c = \frac{gS}{C} = \frac{43 \times 3181}{96} = 1424.82\ veh/h$$

$$X = \frac{v}{c} = \frac{554}{1424.82} = 0.39$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{43}{96})^2}{1 - 0.39 \times 43/96} + 900 \times 0.25 \times \left[(0.39 - 1) + \sqrt{(0.39-1)^2 + \frac{8 \times 0.5 \times 0.39}{1424.82 \times 0.25}} \right] = 18.52\ s$$

Eastbound Right Turn

$C = 96s$

$g = 43s$

$v = 179\ veh/h$

$S = 3181\ veh/h$

$$c = \frac{gS}{C} = \frac{43 \times 3181}{96} = 1424.82\ veh/h$$

$$X = \frac{v}{c} = \frac{179}{1424.82} = 0.13$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{43}{96})^2}{1 - 0.13 \times 43/96} + 900 \times 0.25 \times \left[(0.13 - 1) + \sqrt{(0.13-1)^2 + \frac{8 \times 0.5 \times 0.13}{1424.82 \times 0.25}} \right] = 15.68\ s$$

Westbound Left Turn

$C = 96s$

$g = 25s$

$v = 189\ veh/h$

$S = 1652\ veh/h$

$$c = \frac{gS}{C} = \frac{25 \times 1652}{96} = 430.21\ veh/h$$

$$X = \frac{v}{c} = \frac{189}{430.21} = 0.44$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{25}{96})^2}{1 - 0.44 \times 25/96} + 900 \times 0.25 \times \left[(0.44 - 1) + \sqrt{(0.44-1)^2 + \frac{8 \times 0.5 \times 0.44}{430.21 \times 0.25}} \right] = 32.88\ s$$

Westbound Throughway

$C = 96\ s$

$g = 68\ s$

$v = 809\ veh/h$

$S = 1739\ veh/h$

$c = \frac{gS}{C} = \frac{68 \times 1739}{96} = 1231.79\ veh/h$

$X = \frac{v}{C} = \frac{809}{1231.79} = 0.66$

$d = \frac{0.5 \times 96 \times (1 - \frac{68}{96})^2}{1 - 0.66 \times 68/96} + 900 \times 0.25 \times \left[(0.66 - 1) + \sqrt{(0.66-1)^2 + \frac{8 \times 0.5 \times 0.66}{1231.79 \times 0.25}} \right] = 10.38\ s$

Southbound Left Turn

$C = 96\ s$

$g = 28\ s$

$v = 63\ veh/h$

$S = 4586\ veh/h$

$c = \frac{gS}{C} = \frac{28 \times 4586}{96} = 1337.58\ veh/h$

$X = \frac{v}{C} = \frac{63}{1337.58} = 0.05$

$d = \frac{0.5 \times 96 \times (1 - \frac{28}{96})^2}{1 - 0.05 \times 28/96} + 900 \times 0.25 \times \left[(0.05 - 1) + \sqrt{(0.05-1)^2 + \frac{8 \times 0.5 \times 0.05}{1337.58 \times 0.25}} \right] = 24.49\ s$

Southbound Throughway

$C = 96\ s$

$g = 28\ s$

$v = 440\ veh/h$

$S = 4586\ veh/h$

$c = \frac{gS}{C} = \frac{28 \times 4586}{96} = 1337.58\ veh/h$

$X = \frac{v}{C} = \frac{440}{1337.58} = 0.33$

$d = \frac{0.5 \times 96 \times (1 - \frac{28}{96})^2}{1 - 0.33 \times 28/96} + 900 \times 0.25 \times \left[(0.33 - 1) + \sqrt{(0.33-1)^2 + \frac{8 \times 0.5 \times 0.33}{1337.58 \times 0.25}} \right] = 27.30\ s$

Southbound Right Turn

$C = 96\,s$

$g = 28\,s$

$v = 119$ veh/h

$S = 4586$ veh/h

$c = \frac{gS}{C} = \frac{28 \times 4586}{96} = 1337.58$ veh/h

$X = \frac{v}{C} = \frac{119}{1337.58} = 0.09$

$d = \frac{0.5 \times 96 \times (1 - \frac{28}{96})^2}{1 - 0.09 \times 28/96} + 900 \times 0.25 \times \left[(0.09 - 1) + \sqrt{(0.09-1)^2 + \frac{8 \times 0.5 \times 0.09}{1337.58 \times 0.25}} \right] = 24.86\,s$

7. NORTH 5TH STREET & SANTA CLARA STREET INTERSECTION

Eastbound Left Turn

$C = 96\,s$

$g = 71\,s$

$v = 106$ veh/h

$S = 2121$ veh/h

$c = \frac{gS}{C} = \frac{71 \times 2121}{96} = 1568.66$ veh/h

$X = \frac{v}{C} = \frac{106}{1568.66} = 0.07$

$d = \frac{0.5 \times 96 \times (1 - \frac{71}{96})^2}{1 - 0.07 \times 71/96} + 900 \times 0.25 \times \left[(0.07 - 1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.5 \times 0.07}{1568.66 \times 0.25}} \right] = 3.51\,s$

Eastbound Throughway

$C = 96\,s$

$g = 71\,s$

$v = 702$ veh/h

$S = 2121$ veh/h

$c = \frac{gS}{C} = \frac{71 \times 2121}{96} = 1568.66$ veh/h

$X = \frac{v}{C} = \frac{702}{1568.66} = 0.45$

$d = \frac{0.5 \times 96 \times (1 - \frac{71}{96})^2}{1 - 0.45 \times 71/96} + 900 \times 0.25 \times \left[(0.45 - 1) + \sqrt{(0.45-1)^2 + \frac{8 \times 0.5 \times 0.45}{1568.66 \times 0.25}} \right] = 5.79\,s$

Westbound Throughway

$C = 96s$

$g = 71s$

$v = 1028$ veh/h

$S = 3234$ veh/h

$c = \frac{gS}{C} = \frac{71 \times 3234}{96} = 2391.81$ veh/h

$x = \frac{v}{c} = \frac{1028}{2391.81} = 0.43$

$d = \frac{0.5 \times 96 \times (1 - \frac{71}{96})^2}{1 - 0.43 \times 71/96} + 900 \times 0.25 \times \left[(0.43 - 1) + \sqrt{(0.43-1)^2 + \frac{8 \times 0.25 \times 0.43}{2391.81 \times 0.25}} \right] = 5.34s$

Westbound Right Turn

$C = 96s$

$g = 71s$

$v = 165$ veh/h

$S = 3234$ veh/h

$c = \frac{gS}{v} = \frac{71 \times 3234}{165} = 2391.81$ veh/h

$x = \frac{v}{c} = \frac{165}{2391.81} = 0.07$

$d = \frac{0.5 \times 96 \times (1 - \frac{71}{96})^2}{1 - 0.07 \times 71/96} + 900 \times 0.25 \times \left[(0.07 - 1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.25 \times 0.07}{2391.81 \times 0.25}} \right] = 3.49s$

Southbound Left Turn

$C = 96s$

$g = 25s$

$v = 15$ veh/h

$S = 1557$ veh/h

$c = \frac{gS}{v} = \frac{25 \times 1557}{15} = 405.47$ veh/h

$x = \frac{v}{c} = \frac{15}{405.47} = 0.04$

$d = \frac{0.5 \times 96 \times (1 - \frac{25}{96})^2}{1 - 0.04 \times 25/96} + 900 \times 0.25 \times \left[(0.04 - 1) + \sqrt{(0.04-1)^2 + \frac{8 \times 0.25 \times 0.04}{405.47 \times 0.25}} \right] = 26.68s$

Southbound Right Turn

$C = 96s$

$g = 25s$

$v = 30\ veh/h$

$S = 1557\ veh/h$

$c = \frac{gS}{C} = \frac{25 \times 1557}{96} = 405.47\ veh/h$

$X = \frac{v}{c} = \frac{30}{405.47} = 0.07$

$d = \frac{0.5 \times 96 \times (1 - \frac{25}{96})^2}{1 - 0.07 \times 25/96} + 900 \times 0.25 \times [(0.07 - 1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.5 \times 0.07}{405.47 \times 0.25}}] = 27.13s$

8. NORTH 6TH STREET & SANTA CLARA STREET INTERSECTION

Eastbound Left Turn

$C = 96s$

$g = 11s$

$v = 37\ veh/h$

$S = 1652\ veh/h$

$c = \frac{gS}{C} = \frac{11 \times 1652}{96} = 189.29\ veh/h$

$X = \frac{v}{C} = \frac{37}{189.29} = 0.20$

$d = \frac{0.5 \times 96 \times (1 - \frac{11}{96})^2}{1 - 0.20 \times 11/96} + 900 \times 0.25 \times [(0.20 - 1) + \sqrt{(0.20-1)^2 + \frac{8 \times 0.5 \times 0.20}{189.29 \times 0.25}}] = 40.79s$

Eastbound Throughway

$C = 96s$

$g = 56s$

$v = 538\ veh/h$

$S = 1704\ veh/h$

$c = \frac{gS}{C} = \frac{56 \times 1704}{96} = 994\ veh/h$

$X = \frac{v}{C} = \frac{538}{994} = 0.54$

$d = \frac{0.5 \times 96 \times (1 - \frac{56}{96})^2}{1 - [illegible]} + 900 \times 0.25 \times [(0.54 - 1) + \sqrt{(0.54-1)^2 + \frac{8 \times 0.5 \times 0.54}{994 \times 0.25}}] = 14.29s$

Eastbound Right Way

$C=96s$

$g=56s$

$v=83\ veh/h$

$S=1704\ veh/h$

$c=\frac{gS}{C}=\frac{56\times1704}{96}=994\ veh/h$

$x=\frac{v}{c}=\frac{83}{994}=0.08$

$$d=\frac{0.5\times96\times(1-\frac{56}{96})^2}{1-0.08\times56/96}+900\times0.25\times\left[(0.08-1)+\sqrt{(0.08-1)^2+\frac{8\times0.5\times0.08}{994\times0.25}}\right]=8.92s$$

Westbound Left Turn

$C=96s$

$g=11s$

$v=33\ veh/h$

$S=1652\ veh/h$

$c=\frac{gS}{C}=\frac{11\times1652}{96}=189.29\ veh/h$

$x=\frac{v}{c}=\frac{33}{189.29}=0.17$

$$d=\frac{0.5\times96\times(1-\frac{11}{96})^2}{1-0.17\times11/96}+900\times0.25\times\left[(0.17-1)+\sqrt{(0.17-1)^2+\frac{8\times0.5\times0.17}{189.29\times0.25}}\right]=44.39s$$

Westbound Throughway

$C=96s$

$g=56s$

$v=1123\ veh/h$

$S=3247\ veh/h$

$c=\frac{gS}{C}=\frac{56\times3247}{96}=1894.08\ veh/h$

$x=\frac{v}{c}=\frac{1123}{1894.08}=0.59$

$$d=\frac{0.5\times96\times(1-\frac{56}{96})^2}{1-0.59\times56/96}+900\times0.25\times\left[(0.59-1)+\sqrt{(0.59-1)^2+\frac{8\times0.5\times0.59}{1894.08\times0.25}}\right]=14.11s$$

Westbound Right Turn

$C=96s$

$g=56s$

$v=146\ veh/h$

$S=3247\ veh/h$

$c=\frac{gS}{C}=\frac{56\times3247}{96}=1894.08\ veh/h$

$x=\frac{v}{c}=\frac{146}{1894.08}=0.08$

$$d=\frac{0.5\times96\times(1-\frac{56}{96})^2}{1-0.08\times56/96}+900\times0.25\times\left[(0.08-1)+\sqrt{(0.08-1)^2+\frac{8\times0.5\times0.08}{1894.08\times0.25}}\right]=8.81s$$

Northbound Left Turn

$C = 96s$

$g = 29s$

$v = 33$ veh/h

$S = 1106$ veh/h

$c = \frac{gS}{C} = \frac{29 \times 1106}{96} = 334.10$ veh/h

$X = \frac{v}{C} = \frac{33}{334.10} = 0.10$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.1 \times 29/96} + 900 \times 0.25 \times [(0.10 - 1) + \sqrt{(0.10-1)^2 + \frac{8 \times 0.5 \times 0.10}{334.10 \times 0.25}}] = 24.69\,s$

North bound Throughway

$C = 96s$

$g = 29s$

$v = 34$ veh/h

$S = 1624$ veh/h

$c = \frac{gS}{C} = \frac{29 \times 1624}{96} = 490.58$ veh/h

$X = \frac{v}{C} = \frac{34}{490.58} = 0.07$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.07 \times 29/96} + 900 \times 0.25 \times [(0.07 - 1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.5 \times 0.07}{490.58 \times 0.25}}] = 24.15\,s$

Northbound Right Turn

$C = 96s$

$g = 29s$

$v = 27$ veh/h

$S = 1624$ veh/h

$c = \frac{gS}{C} = \frac{29 \times 1624}{96} = 490.58$ veh/h

$X = \frac{v}{C} = \frac{27}{490.58} = 0.06$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.06 \times 29/96} + 900 \times 0.25 \times [(0.06 - 1) + \sqrt{(0.06-1)^2 + \frac{8 \times 0.5 \times 0.06}{490.58 \times 0.25}}] = 24.00\,s$

Southbound Left Turn

$C = 96s$

$g = 29s$

$v = 48\ veh/h$

$S = 1247\ veh/h$

$c = \frac{gS}{C} = \frac{29 \times 1247}{96} = 376.70\ veh/h$

$X = \frac{v}{C} = \frac{48}{376.70} = 0.13$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.13 \times 29/96} + 900 \times 0.25 \times \left[(0.13 - 1) + \sqrt{(0.13-1)^2 + \frac{8 \times 0.5 \times 0.13}{376.70 \times 0.25}} \right] = 25.01\ s$

Southbound Throughway

$C = 96s$

$g = 29s$

$v = 80\ veh/h$

$S = 1641\ veh/h$

$c = \frac{gS}{C} = \frac{29 \times 1641}{96} = 495.72\ veh/h$

$X = \frac{v}{C} = \frac{80}{495.72} = 0.16$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.16 \times 29/96} + 900 \times 0.25 \times \left[(0.16 - 1) + \sqrt{(0.16-1)^2 + \frac{8 \times 0.5 \times 0.16}{495.72 \times 0.25}} \right] = 25.28\ s$

Southbound Right Turn

$C = 96s$

$g = 29s$

$v = 48\ veh/h$

$S = 1641\ veh/h$

$c = \frac{gS}{C} = \frac{29 \times 1641}{96} = 495.72\ veh/h$

$X = \frac{v}{C} = \frac{48}{495.72} = 0.10$

$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.1 \times 29/96} + 900 \times 0.25 \times \left[(0.10 - 1) + \sqrt{(0.1-1)^2 + \frac{8 \times 0.5 \times 0.1}{495.72 \times 0.25}} \right] = 24.47\ s$

PM

1. SAN PEDRO STREET & SANTA CLARA STREET INTERSECTION

Eastbound Left Turn

$C = 118s$

$g = 18.0s$

$v = 264\ veh/h$

$s = 3270\ veh/h$

$$c = \frac{gs}{C} = \frac{18.0 \times 3270}{118} = 498.81\ veh/h$$

$$x = \frac{v}{c} = \frac{264}{118} = 0.529256$$

$$d = \frac{0.5 \times 118 \times (1 - \frac{18.0}{118})^2}{1 - 0.53 \times 18.0/118} + 900 \times 0.25 \times \left[(0.53 - 1) + \sqrt{(0.53-1) + \frac{8 \times 0.5 \times 0.53}{498.81 \times 0.25}} \right]$$

$$= 50.08s$$

Eastbound Throughway

$C = 118s$

$g = 75.4s$

$v = 1146\ veh/h$

$s = 3270\ veh/h$

$$c = \frac{gs}{C} = \frac{75.4 \times 3270}{118} = 2089.48\ veh/h$$

$$x = \frac{v}{c} = \frac{114}{2089.45} = 0.55$$

$$d = \frac{0.5 \times 208 \times (1 - 75.4/118)^2}{1 - 0.55 \times 75.4/118} + 900 \times 0.25 \times \left[(0.55 - 1) + \sqrt{(0.55-1) + \frac{8 \times 0.5 \times 0.55}{2089.48 \times 0.25}} \right) =$$

$$= 12.88s$$

Eastbound Right Turn

$C = 118s$

$g = 57.4s$

$v = 86\ veh/h$

$s = 3270\ veh/h$

$$c = \frac{g \cdot s}{C} = \frac{75.4 \times 3270}{118} = 2089.48$$

$$x = \frac{v}{c} = \frac{86}{118} = 0.04$$

$$d = \frac{0.5 \times 118 \times (1 - 57.4/118)^2}{1 - 0.04 \times 75.4/118} + 900 \times 0.25 \times \left[(0.04 - 1) + \sqrt{(0.04-1) + \frac{8 \times 0.5 \times 0.04}{2089.48 \times 0.25}} \right.$$

$$= 7.93s$$

Westbound Left Turn

$C = 118s$

$g = 9.6s$

$v = 43 veh/h$

$S = 2724 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{9.6 \times 2724}{118} = 221.61$$

$$x = \frac{v}{c} = \frac{43}{221.6} = 0.19$$

$$d = \frac{0.5 \times 118 \times (1 - \frac{9.6}{118})^2}{1 - 0.19 \times 9.6/118} + 900 \times 0.25 \times \left[(0.19 - 1) + \sqrt{(0.19-1)^2 + \frac{8 \times 0.5 \times 0.19}{221.6 \times 0.25}} \right]$$

$$= 52.53s$$

Westbound Throughway

$C = 118s$

$g = 67s$

$v = 870 veh/h$

$S = 2724 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{67 \times 2724}{118} = 1546.7$$

$$x = \frac{v}{c} = \frac{870}{1546.7} = 0.56$$

$$d = \frac{0.5 \times 118 \times (1 - \frac{67}{118})^2}{1 - 0.56 \times 67/118} + 900 \times 0.25 \times \left[(0.56 - 1) + \sqrt{(0.56-1)^2 + \frac{8 \times 0.5 \times 0.56}{1546.7 \times 0.25}} \right]$$

$$= 17.68s$$

Westbound Right Turn

$C = 118s$

$g = 67s$

$v = 110 veh/h$

$S = 2724 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{67 \times 2724}{118} = 1546.7$$

$$x = \frac{v}{c} = \frac{110}{1546.7} = 0.07$$

$$d = \frac{0.5 \times 118 \times (1 - 67/118)^2}{1 - 0.07 \times 67/118} + 900 \times 0.25 \times \left[(0.07 - 1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.5 \times 0.07}{1546.7 \times 0.25}} \right]$$

$$= 11.57s$$

Northbound Left Turn

$C = 118\,s$

$g = 33s$

$v = 75\,veh/h$

$s = 1044\,veh/h$

$c = \frac{g \cdot S}{C} = \frac{33 \times 1044}{118} = 291.97\,veh/h$

$x = \frac{v}{c} = \frac{75}{118} = 0.26$

$$d = \frac{0.5 \times 118 \times (1 - \frac{33}{118})^2}{1 - 0.26 \times 33/118} + 900 \times 0.25 \times \left[(0.26 - 1) + \sqrt{(0.26-1)^2 + \frac{8 \times 0.5 \times 0.26}{291.97 \times 0.25}}\right]$$

$= 35.10s$

Northbound Throughway

$C = 118$

$g = 33s$

$v = 28\,veh/h$

$s = 1044\,veh/h$

$c = \frac{g \cdot S}{C} = \frac{33 \times 1044}{118} = 291.97\,veh/h$

$x = \frac{v}{C} = \frac{28}{118} = 0.10$

$$d = \frac{0.5 \times 118 \times (1 - \frac{33}{118})^2}{1 - 0.10 \times 33/118} + 900 \times 0.25 \times \left[(0.10 - 1) + \sqrt{(0.10-1)^2 + \frac{8 \times 0.5 \times 0.10}{291.97 \times 0.25}}\right]$$

$= 32.11$

Northbound Right Turn

$C = 118$

$g = 33s$

$v = 27\,veh/h$

$s = 1044\,veh/h$

$c = \frac{g \cdot S}{C} = \frac{33 \times 1044}{118} = 291.97\,veh/h$

$x = \frac{v}{C} = \frac{27}{118} = 0.10$

$$d = \frac{0.5 \times 118 \times (1 - \frac{33}{118})^2}{1 - 0.10 \times 33/118} + 900 \times 0.25 \times \left[(0.10 - 1) + \sqrt{(0.10-1)^2 + \frac{8 \times 0.5 \times 0.10}{291.97 \times 0.25}}\right]$$

$= 32.05$

Southbound Left Turn

$C = 118s$

$g = 33s$

$v = 28 veh/h$

$S = 1521 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{33 \times 1521}{118} = 425.36 veh/h$$

$$x = \frac{v}{c} = \frac{28}{425.36} = 0.07$$

$$d = \frac{0.5 \times 118 \times (1 - \frac{33}{118})^2}{1 - 0.07 \times 33/118} + 900 \times 0.25 \times [(0.07 - 1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.5 \times 0.07}{425.36 \times 0.25}}]$$

$$= 31.49s$$

Southbound Throughway

$C = 96s$

$g = 29s$

$v = 21 veh/h$

$S = 1560 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{29 \times 1560}{96} = 471.25 veh/h$$

$$x = \frac{v}{c} = \frac{21}{471.25} = 0.04$$

$$d = \frac{0.5 \times 96 \times (1 - \frac{29}{96})^2}{1 - 0.04 \times 29/96} + 900 \times 0.25 \times [(0.04 - 1) + \sqrt{(0.04-1)^2 + \frac{8 \times 0.5 \times 0.04}{471.25 \times 0.25}}]$$

$$= 32.56 s$$

Southbound Right Turn

$C = 118s$

$g = 33s$

$v = 128 veh/h$

$S = 1521 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{33 \times 1521}{118} = 425.36 veh/h$$

$$x = \frac{v}{c} = \frac{128}{425.36} = 0.30$$

$$d = \frac{0.5 \times 118 \times (1 - \frac{33}{118})^2}{1 - 0.30 \times 33/118} + 900 \times 0.25 \times [(0.30 - 1) + \sqrt{(0.30-1)^2 + \frac{8 \times 0.5 \times 0.30}{425.36 \times 0.30}}]$$

$$= 35.24 s$$

2. SANTA CLARA STREET & NORTH MARKET STREET

Eastbound Left Turn

$C = 118s$

$g = 9.6s$

$v = 110 veh/h$

$S = 3477 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{9.6 \times 3477}{118} = 282.87 veh/h$$

$$x = \frac{v}{c} = \frac{110}{282.87} = 0.39$$

$$d = \frac{0.5 \times 118 \times (1 - 9.6/118)^2}{1 - 0.39 \times 9.6/118} + 900 \times 0.25 \times \left[(0.39 - 1) + \sqrt{(0.39-1)^2 + \frac{8 \times 0.5 \times 0.39}{282.87 \times 0.25}} \right]$$

$$= 55.41s$$

Eastbound Throughway

$C = 118s$

$g = 45.4s$

$v = 925 veh/h$

$S = 3477 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{45.4 \times 3477}{118} = 1337.76 veh/h$$

$$x = \frac{v}{c} = \frac{925}{1337.76} = 0.69$$

$$d = \frac{0.5 \times 118 \times (1 - 45.4/118)^2}{1 - 0.69 \times 45.4/118} + 900 \times 0.25 \times \left[(0.69 - 1) + \sqrt{(0.69-1)^2 + \frac{8 \times 0.5 \times 0.69}{1337.76 \times 0.25}} \right]$$

$$= 33.38s$$

Eastbound Right Turn

$C = 118s$

$g = 45.4s$

$v = 110 veh/h$

$S = 3477 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{45.4 \times 3477}{118} = 1337.76 veh/h$$

$$x = \frac{v}{c} = \frac{110}{1337.76} = 0.08$$

$$d = \frac{0.5 \times 118 \times (1 - 45.4/118)^2}{1 - 0.08 \times 45.4/118} + 900 \times 0.25 \times \left[(0.08 - 1) + \sqrt{(0.08-1)^2 + \frac{8 \times 0.5 \times 0.08}{1337.76 \times 0.25}} \right]$$

Westbound Left Turn

$C = 118s$

$g = 9.6s$

$v = 156 veh/h$

$s = 3016 veh/h$

$c = \frac{g \cdot s}{C} = \frac{9.6 \times 3016}{118} = 245.37 veh/h$

$x = \frac{v}{c} = \frac{156}{245.37} = 0.64$

$$d = \frac{0.5 \times 118 \times (1 - 9.6/118)^2}{1 - 0.64 \times 9.6/118} + 900 \times 0.25 \times \left[(0.64 - 1) + \sqrt{(0.64 - 1) + \frac{8 \times 0.5 \times 0.64}{245.37 \times 0.25}} \right]$$

$= 64.44s$

Westbound Throughway

$C = 118s$

$g = 45.4s$

$v = 615 veh/h$

$s = 3016 veh/h$

$c = \frac{g \cdot s}{C} = \frac{45.4 \times 3016}{118} = 1160.40 veh/h$

$x = \frac{v}{c} = \frac{615}{1160.40} = 0.53$

$$d = \frac{0.5 \times 118 \times (1 - 45.4/118)^2}{1 - 0.53 \times 45.4/118} + 900 \times 0.25 \times \left[(0.53 - 1) + \sqrt{(0.53 - 1) + \frac{8 \times 0.5 \times 0.53}{1160.40 \times 0.25}} \right]$$

$= 29.79$

Westbound Right Turn

$C = 118s$

$g = 45.4s$

$v = 104 veh/h$

$s = 3016 veh/h$

$c = \frac{g \cdot s}{C} = \frac{45.4 \times 3016}{118} = 1160.40 veh/h$

$x = \frac{v}{c} = \frac{104}{1160.40} = 0.09$

$$d = \frac{0.5 \times 118 \times (1 - 45.4/118)^2}{1 - 0.09 \times 45.4/118} + 900 \times 0.25 \times \left[(0.09 - 1) + \sqrt{(0.09 - 1) + \frac{8 \times 0.5 \times 0.09}{\cdots}} \right] = 23.28$$

Northbound Left Turn

$C = 118s$

$g = 9.6s$

$v = 101 veh/h$

$S = 3002 veh/h$

$c = \frac{g \cdot S}{C} = \frac{9.6 \times 3002}{118} = 244.23 veh/h$

$x = \frac{v}{c} = \frac{101}{244.23} = 0.41$

$$d = \frac{0.5 \times 118 \times (1 - 9.6/118)^2}{1 - 0.41 \times 9.6/118} + 900 \times 0.25 \times \left[(0.41 - 1) + \sqrt{(0.41-1)^2 + \frac{8 \times 0.5 \times 0.41}{244.23 \times 0.25}}\right]$$

$= 56.62s$

Northbound Throughway

$C = 118s$ $S = 3002 veh/h$

$g = 53.4s$

$v = 338 veh/h$

$c = \frac{g \cdot S}{C} = \frac{53.4 \times 3002}{118} = 1358.53 veh/h$

$x = \frac{v}{C} = \frac{338}{1358.53} = 0.25$

$$d = \frac{0.5 \times 118 \times (1 - 53.4/118)^2}{1 - 0.25 \times 53.4/118} + 900 \times 0.25 \times \left[(0.25 - 1) + \sqrt{(0.25-1)^2 + \frac{8 \times 0.5 \times 0.25}{1358.53 \times 0.25}}\right]$$

$= 20.36s$

Northbound Right Turn

$C = 118s$

$g = 53.4s$

$v = 85 veh/h$

$S = 3002 veh/h$

$c = \frac{g \cdot S}{C} = \frac{53.4 \times 3002}{118} = 1358.53 veh/h$

$x = \frac{v}{C} = \frac{85}{1358.53} = 0.06$

$$d = \frac{0.5 \times 118 \times (1 - 0.06/118)^2}{1 - 0.25 \times 53.4/118} + 900 \times 0.25 \times \left[(0.06 - 1) + \sqrt{(0.06-1)^2 + \frac{8 \times 0.5 \times 0.06}{1358.53 \times 0.25}}\right]$$

$= 18.29s$

Southbound Left Turn

$C = 118s$

$g = 9.6s$

$v = 207 veh/h$

$s = 3529 veh/h$

$$c = \frac{g \cdot s}{C} = \frac{9.6 \times 3529}{118} = 287.11 veh/h$$

$$x = \frac{v}{c} = \frac{207}{287.11} = 0.72$$

$$d = \frac{0.5 \times 118 \times (1 - 9.6/118)^2}{1 - 0.72 \times 9.6/118} + 900 \times 0.25 \times [(0.72 - 1) + \sqrt{(0.72-1)^2 + \frac{8 \times 0.5 \times 0.72}{287.11 \times 0.25}}]$$

$$= 67.41$$

Southbound Throughway

$C = 118s$

$g = 53.4s$

$v = 1161 veh/h$

$s = 3529 veh/h$

$$c = \frac{g \cdot s}{C} = \frac{53.4 \times 3529}{118} = 1597.02 veh/h$$

$$x = \frac{v}{c} = \frac{1267}{1597.02} = 0.73$$

$$d = \frac{0.5 \times 118 \times (1 - 53.4/118)^2}{1 - 0.73 \times 53.4/118} + 900 \times 0.25 \times [(0.73 - 1) + \sqrt{(0.73-1)^2 + \frac{8 \times 0.5 \times 0.73}{1597.02 \times 0.25}}]$$

$$= 29.28$$

Southbound Right Turn

$C = 118s$

$g = 53.4s$

$v = 203 veh/h$

$s = 3529 veh/h$

$$c = \frac{g \cdot s}{C} = \frac{53.4 \times 3529}{118} = 1597.02 veh/h$$

$$x = \frac{v}{c} = \frac{203}{1597.02} = 0.13$$

$$d = \frac{0.5 \times 118 \times (1 - 53.4/118)^2}{1 - 0.13 \times 53.4/118} + 900 \times 0.25 \times [(0.13 - 1) + \sqrt{(0.13-1)^2 + \frac{8 \times 0.5 \times 0.13}{1597.02 \times 0.25}}]$$

$$= 18.92$$

3. NORTH 1ST STREET & SANTA CLARA STREET

Eastbound Left Turn

$C = 118s$

$g = 9.7s$

$v = 137 veh/h$

$S = 2335 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{9.7 \times 2335}{118} = 191.94 veh/h$$

$$x = \frac{v}{c} = \frac{137}{191.94} = 0.71$$

$$d = \frac{0.5 \times 118 \times (1 - 9.7/118)^2}{1 - 0.71 \times 9.7/118} + 900 \times 0.25 \times \left[(0.71-1) + \sqrt{(0.71-1)^2 + \frac{8 \times 0.5 \times 0.71}{191.94 \times 0.25}}\right] = 73.01s$$

Eastbound Throughway

$C = 118s$

$g = 87s$

$v = 1290 veh/h$

$S = 2335 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{87 \times 2335}{118} = 1721.57 veh/h$$

$$x = \frac{v}{c} = \frac{1290}{1721.57} = 0.75$$

$$d = \frac{0.5 \times 118 \times (1 - 87/118)^2}{1 - 0.75 \times 87/118} + 900 \times 0.25 \times \left[(0.75-1) + \sqrt{(0.75-1)^2 + \frac{8 \times 0.5 \times 0.75}{1721.57 \times 0.25}}\right] = 12.14s$$

Westbound Throughway

$C = 118s$

$g = 77.3s$

$v = 769 veh/h$

$S = 3277 veh/h$

$$c = \frac{g \cdot S}{C} = \frac{77.3 \times 3277}{118} = 2146.71 veh/h$$

$$x = \frac{v}{c} = \frac{769}{2146.71} = 0.36$$

$$d = \frac{0.5 \times 118 \times (1 - 77.3/118)^2}{1 - 0.36 \times 77.3/118} + 900 \times 0.25 \times \left[(0.36-1) + \sqrt{(0.36-1)^2 + \frac{8 \times 0.5 \times 0.36}{1721.57 \times 0.25}}\right]$$

$$= 9.64s$$

Westbound Right Turn

$C = 118s$

$g = 77.3s$

$v = 45 veh/h$

$s = 3277 veh/h$

$c = \frac{g \cdot s}{C} = \frac{77.3 \times 3277}{118} = 2146.71 veh/h$

$x = \frac{v}{c} = \frac{45}{2146.71} = 0.02$

$d = \frac{0.5 \times 118 \times (1 - 77.3/118)^2}{1 - 0.02 \times 77.3/118} + 900 \times 0.25 \times \left[(0.02-1) + \sqrt{(0.02-1)^2 + \frac{8 \times 0.5 \times 0.02}{2146.71 \times 0.25}}\right] = 7.13s$

Northbound Left Turn

$C = 118s$

$g = 31s$

$v = 116 veh/h$

$s = 3114 veh/h$

$c = \frac{g \cdot s}{C} = \frac{31 \times 3114}{118} = 818.08 veh/h$

$x = \frac{v}{c} = \frac{116}{818.08} = 0.14$

$d = \frac{0.5 \times 118 \times (1 - 31/118)^2}{1 - 0.14 \times 31/118} + 900 \times 0.25 \times \left[(0.14-1) + \sqrt{(0.14-1)^2 + \frac{8 \times 0.5 \times 0.14}{818.08 \times 0.25}}\right] = 33.68s$

Northbound Throughway

$C = 118s$

$g = 31s$

$v = 180 veh/h$

$s = 3114 veh/h$

$c = \frac{g \cdot s}{C} = \frac{31 \times 3114}{118} = 818.08 veh/h$

$x = \frac{v}{c} = \frac{180}{818.08} = 0.22$

$d = \frac{0.5 \times 118 \times (1 - 31/118)^2}{1 - 0.22 \times 31/118} + 900 \times 0.25 \times \left[(0.22-1) + \sqrt{(0.22-1)^2 + \frac{8 \times 0.5 \times 0.22}{818.08 \times 0.25}}\right] = 34.66s$

Northbound Right Turn

$C = 118s$

$g = 31s$

$v = 128 veh/h$

$s = 3114 veh/h$

$c = \frac{g \cdot s}{C} = \frac{31 \times 3114}{118} = 18.08 veh/h$

$x = \frac{v}{c} = \frac{128}{18.08} = 0.16$

$d = \frac{0.5 \times 118 \times (1 - 31/118)^2}{1 - 0.16 \times 31/118} + 900 \times 0.25 \times [(0.16-1) + \sqrt{(0.16-1)^2 + \frac{8 \times 0.5 \times 0.16^2}{18.08 \times 0.25}}] = 33.85$

4. NORTH 2ND STREET & SANTA CLARA STREET

Eastbound Throughway

$C = 118s$

$g = 67.4s$

$v = 1128 veh/h$

$s = 3254 veh/h$

$c = \frac{g \cdot s}{C} = \frac{67.4 \times 3254}{118} = 1858.64 veh/h$

$x = \frac{v}{c} = \frac{1128}{1858.64} = 0.61$

$d = \frac{0.5 \times 118 \times (1 - 67.4/118)^2}{1 - 0.61 \times 67.4/118} + 900 \times 0.25 \times [(0.61-1) + \sqrt{(0.61-1)^2 + \frac{8 \times 0.5 \times 0.61^2}{1858.64 \times 0.25}}] = 18.01$

Eastbound Right Turn

$C = 118s$

$g = 67.4s$

$v = 127 veh/h$

$s = 3254 veh/h$

$c = \frac{g \cdot s}{C} = \frac{67.4 \times 3254}{118} = 1858.64 veh/h$

$x = \frac{v}{c} = \frac{127}{1858.64} = 0.07$

$d = \frac{0.5 \times 118 \times (1 - 67.4/118)^2}{1 - 0.07 \times 67.4/118} + 900 \times 0.25 \times [(0.07-1) + \sqrt{(0.07-1)^2 + \frac{8 \times 0.5 \times 0.07^2}{1858.64 \times 0.25}}]$

$= 11.36s$

Westbound Left Turn

$C = 118s$

$g = 12.6s$

$v = 124 veh/h$

$s = 3280 veh/h$

$c = \frac{g \cdot s}{C} = \frac{12.6 \times 3280}{118} = 350.23 veh/h$

$x = \frac{v}{c} = \frac{124}{350.23} = 0.35$

$d = \frac{0.5 \times 118 \times (1 - 12.6/118)^2}{1 - 0.35 \times 12.6/118} + 900 \times 0.25 \times [(0.35-1) + \sqrt{(0.35-1)^2 + \frac{8 \times 0.5 \times 0.35^2}{350.23 \times 0.25}}] = 51.71s$

Westbound Throughway

$C = 118s$

$g = 80s$

$v = 738 veh/h$

$s = 3280 veh/h$

$c = \frac{g \cdot s}{C} = \frac{80 \times 3280}{118} = 2223.73 veh/h$

$x = \frac{v}{c} = \frac{738}{2223.73} = 0.33$

$d = \frac{0.5 \times 118 \times (1 - 80/118)^2}{1 - 0.33 \times 80/118} + 900 \times 0.25 \times [(0.33-1) + \sqrt{(0.33-1)^2 + \frac{8 \times 0.5 \times 0.33^2}{2223.73 \times 0.25}}] = 8.30s$

Southbound Left Turn

$C = 118s$

$g = 38s$

$v = 124 veh/h$

$s = 3208 veh/h$

$c = \frac{g \cdot s}{C} = \frac{38 \times 3208}{118} = 1033.08 veh/h$

$x = \frac{v}{c} = \frac{124}{1033.08} = 0.12$

$d = \frac{0.5 \times 118 \times (1 - 38/118)^2}{1 - 0.12 \times 38/118} + 900 \times 0.25 \times [(0.12-1) + \sqrt{(0.12-1)^2 + \frac{8 \times 0.5 \times 0.12^2}{1033.08 \times 0.25}}] = 28.45s$

Southbound Through way

$C = 118s$

$g = 38s$

$v = 414 veh/h$

$s = 3208 veh/h$

$c = \frac{g \cdot s}{C} = \frac{38 \times 3208}{118} = 1033.08 veh/h$

$x = \frac{v}{c} = \frac{414}{118} = 0.40$

$d = \frac{0.5 \times 118 \times (1 - 38/118)^2}{1 - 0.40 \times 38/118} + 900 \times 0.25 \times [(0.40-1) + \sqrt{(0.40-1)^2 + \frac{8 \times 0.5 \times 0.40}{1033.08 \times 0.25}}] = 32.29s$

Southbound Right Turn

$C = 118s$

$g = 38s$

$v = 80 veh/h$

$s = 3208 veh/h$

$c = \frac{g \cdot s}{C} = \frac{38 \times 3208}{118} = 1033.08 veh/h$

$x = \frac{v}{c} = \frac{80}{1033.08} = 0.08$

$d = \frac{0.5 \times 118 \times (1 - 38/118)^2}{1 - 0.08 \times 38/118} + 900 \times 0.25 \times [(0.08-1) + \sqrt{(0.08-1)^2 + \frac{8 \times 0.5 \times 0.40}{1033.08 \times 0.25}}] = 27.96s$

5. NORTH 3RD STREET & SANTA CLARA STREET

Eastbound Left Turn

$C = 118s$

$g = 20.6s$

$v = 112 veh/h$

$s = 3465 veh/h$

$c = \frac{g \cdot s}{C} = \frac{20.6 \times 3465}{118} = 604.91 veh/h$

$x = \frac{v}{c} = \frac{112}{604.91} = 0.19$

$d = \frac{0.5 \times 118 \times (1 - 20.6/118)^2}{1 - 0.19 \times 20.6/118} + 900 \times 0.25 \times [(0.19-1) + \sqrt{(0.19-1)^2 + \frac{8 \times 0.5 \times 0.19}{604.91 \times 0.25}}] = 42.21s$

Eastbound Throughway

$C = 118s$

$g = 55.4s$

$v = 1106 veh/h$

$s = 3465 veh/h$

$c = \frac{g \cdot s}{C} = \frac{55.4 \times 3465}{118} = 1626.79 veh/h$

$X = \frac{v}{c} = \frac{1106}{1626.79} = 0.68$

$d = \frac{0.5 \times 118 \times (1 - 55.4/118)^2}{1 - 0.68 \times 55.4/118} + 900 \times 0.25 \times \left[(0.68-1) + \sqrt{(0.68-1)^2 + \frac{8 \times 0.5 \times 0.68}{1626.79 \times 0.25}}\right] = 26.70s$

Westbound Throughway

$C = 118s$

$g = 55.4s$

$v = 788 veh/h$

$s = 4666 veh/h$

$c = \frac{g \cdot s}{C} = \frac{55.4 \times 4666}{118} = 2190.65 veh/h$

$X = \frac{v}{c} = \frac{788}{2190.65} = 0.36$

$d = \frac{0.5 \times 118 \times (1 - 55.4/118)^2}{1 - 0.36 \times 55.4/118} + 900 \times 0.25 \times \left[(0.36-1) + \sqrt{(0.36-1)^2 + \frac{8 \times 0.5 \times 0.36}{2190.65 \times 0.25}}\right] = 20.44s$

Westbound Right Turn

$C = 118s$

$g = 55.4s$

$v = 101 veh/h$

$s = 4666 veh/h$

$c = \frac{g \cdot s}{C} = \frac{55.4 \times 4666}{118} = 2190.65 veh/h$

$X = \frac{v}{c} = \frac{101}{2190.65} = 0.05$

$d = \frac{0.5 \times 118 \times (1 - 55.4/118)^2}{1 - 0.05 \times 55.4/118} + 900 \times 0.25 \times \left[(0.05-1) + \sqrt{(0.05-1)^2 + \frac{8 \times 0.5 \times 0.05}{2190.65 \times 0.25}}\right] = 17.01s$

Northbound Left Turn

$C = 118s$

$g = 42s$

$v = 146 veh/h$

$s = 4562 veh/h$

$c = \frac{gs}{C} = \frac{42 \times 4562}{118} = 1623.76 veh/h$

$x = \frac{v}{c} = \frac{146}{1623.76} = 0.09$

$d = \frac{0.5 \times 118 \times (1 - 42/118)^2}{1 - 0.09 \times 42/118} + 900 \times 0.25 \times \left[\sqrt{(0.09-1)^2 + \frac{8 \times 0.5 \times 0.09}{1623.76 \times 0.25}} + (0.09-1) \right] = 25.35$

Northbound Throughway

$C = 118s$

$g = 42s$

$v = 557 veh/h$

$s = 4562 veh/h$

$c = \frac{g \cdot s}{C} = \frac{42 \times 4562}{118} = 1623.76 veh/h$

$x = \frac{v}{c} = \frac{557}{1623.76} = 0.343$

$d = \frac{0.5 \times 118 \times (1 - 42/118)^2}{1 - 0.34 \times 42/118} + 900 \times 0.25 \times \left[(0.34-1) + \sqrt{(0.34-1)^2 + \frac{8 \times 0.5 \times 0.34}{1623.76 \times 0.25}} \right] = 28.46$

Northbound Right Turn

$C = 118s$

$g = 42s$

$v = 185 veh/h$

$s = 4562 veh/h$

$c = \frac{g \cdot s}{C} = \frac{42 \times 4562}{118} = 623.76 veh/h$

$x = \frac{v}{c} = \frac{185}{623.76} = 0.11$

$d = \frac{0.5 \times 118 \times (1 - 42/118)^2}{1 - 0.11 \times 42/118} + 900 \times 0.25 \times \left[(0.11-1) + \sqrt{(0.11-1)^2 + \frac{8 \times 0.5 \times 0.11}{623.76 \times 0.25}} \right] = 25.65s$

6. NORTH 4TH STREET & SANTA CLARA STREET

Eastbound Throughway

$C = 118s$
$g = 56s$
$v = 951\ veh/h$
$s = 3178\ veh/h$

$$c = \frac{g \cdot s}{C} = \frac{56 \times 3178}{118} = 1508.20\ veh/h$$

$$x = \frac{v}{c} = \frac{951}{1508.20} = 0.63$$

$$d = \frac{0.5 \times 118 \times (1 - 56/118)^2}{1 - 0.63 \times 56/118} + 900 \times 0.25 \times \left[(0.63-1) + \sqrt{(0.63-1)^2 + \frac{8 \times 0.5 \times 0.63}{1508.20 \times 0.25}}\right] = 25.26s$$

Eastbound Right Turn

$C = 118s$
$g = 56s$
$v = 328\ veh/h$
$s = 3178\ veh/h$

$$c = \frac{g \cdot s}{C} = \frac{56 \times 3178}{118} = 1508.20\ veh/h$$

$$x = \frac{v}{c} = \frac{328}{1508.20} = 0.22$$

$$d = \frac{0.5 \times 118 \times (1 - 56/118)^2}{1 - 0.22 \times 56/118} + 900 \times 0.25 \times \left[(0.22-1) + \sqrt{(0.22-1)^2 + \frac{8 \times 0.5 \times 0.22}{1508.20 \times 0.25}}\right] = 18.49s$$

Westbound Left Turn

$C = 118s$
$g = 19s$
$v = 253\ veh/h$
$s = 1652\ veh/h$

$$c = \frac{g \cdot s}{C} = \frac{19 \times 1652}{118} = 266.0\ veh/h$$

$$x = \frac{v}{c} = \frac{253}{266.0} = 0.95$$

$$d = \frac{0.5 \times 118 \times (1 - 19/118)^2}{1 - 0.95 \times 19/118} + 900 \times 0.25 \times \left[(0.95-1) + \sqrt{(0.95-1)^2 + \frac{8 \times 0.5 \times 0.95}{266.0 \times 0.25}}\right] = 92.97s$$

Westbound Throughway

$C = 118s$

$g = 75s$

$v = 642 veh/h$

$s = 1739 veh/h$

$c = \frac{g \cdot s}{C} = \frac{75 \times 1739}{118} = 1105.30 veh/h$

$x = \frac{v}{c} = \frac{642}{1105.30} = 0.58$

$d = \frac{0.5 \times 118 \times (1 - 75/118)^2}{1 - 0.58 \times 75/118} + 900 \times 0.25 \times [(0.58-1) + \sqrt{(0.58-1)^2 + \frac{8 \times 0.5 \times 0.58}{1105.3 \times 0.25}}] = 14.65s$

Southbound Left Turn

$C = 118s$

$g = 43s$

$v = 149 veh/h$

$s = 4647 veh/h$

$c = \frac{g \cdot s}{C} = \frac{43 \times 4647}{118} = 1693.40 veh/h$

$x = \frac{v}{c} = \frac{149}{1693.40} = 0.09$

$d = \frac{0.5 \times 118 \times (1 - 43/118)^2}{1 - 0.09 \times 43/118} + 900 \times 0.25 \times [(0.09-1) + \sqrt{(0.09-1)^2 + \frac{8 \times 0.5 \times 0.09}{1693.40 \times 0.25}}] = 24.73s$

Southbound Through way

$C = 118s$

$g = 43s$

$v = 1131 veh/h$

$s = 4647 veh/h$

$c = \frac{g \cdot s}{C} = \frac{43 \times 4647}{118} = 1693.40 veh/h$

$x = \frac{v}{c} = \frac{1131}{1693.40} = 0.67$

$d = \frac{0.5 \times 118 \times (1 - 43/118)^2}{1 - 0.67 \times 43/118} + 900 \times 0.25 \times [(0.67-1) + \sqrt{(0.67-1)^2 + \frac{8 \times 0.5 \times 0.67}{1693.40 \times 0.25}}] = 33.61s$

Southbound Right Turn

$C = 118s$

$g = 43s$

$v = 150\ veh/h$

$s = 4647\ veh/h$

$c = \frac{g \cdot s}{C} = \frac{43 \times 4647}{118} = 1693.40\ veh/h$

$x = \frac{v}{c} = \frac{150}{1693.40} = 0.09$

$d = \frac{0.5 \times 118 \times (1-43/118)^2}{1-0.09 \times 43/118} + 900 \times 0.25 \times [(0.09-1) + \sqrt{(0.09-1)^2 + \frac{8 \times 0.5 \times 0.09}{1693.40 \times 0.25}}] = 24.73s$

7. NORTH 5TH STREET & SANTA CLARA STREET

Eastbound Left Turn

$C = 118s$

$g = 88s$

$v = 64\ veh/h$

$s = 2755\ veh/h$

$c = \frac{g \cdot s}{C} = \frac{88 \times 2755}{118} = 2054.58\ veh/h$

$x = \frac{v}{c} = \frac{64}{2054.58} = 0.03$

$d = \frac{0.5 \times 118 \times (1-88/118)^2}{1-0.03 \times 88/118} + 900 \times 0.25 \times [(0.03-1) + \sqrt{(0.03-1)^2 + \frac{8 \times 0.5 \times 0.03}{2054.58 \times 0.25}}] = 3.93s$

Eastbound Throughway

$C = 118s$

$g = 88s$

$v = 1149\ veh/h$

$s = 2755\ veh/h$

$c = \frac{g \cdot s}{C} = \frac{88 \times 2755}{118} = 2054.58\ veh/h$

$x = \frac{v}{c} = \frac{1149}{2054.58} = 0.56$

$d = \frac{0.5 \times 118 \times (1-88/118)^2}{1-0.56 \times 88/118} + 900 \times 0.25 \times [(0.56-1) + \sqrt{(0.56-1)^2 + \frac{8 \times 0.5 \times 0.56}{2054.58 \times 0.25}}] = 7.65$

Westbound Throughway

$C = 118s$

$g = 88s$

$v = 811\ veh/h$

$s = 3264\ veh/h$

$c = \frac{g \cdot s}{C} = \frac{88 \times 3264}{118} = 2434.17\ veh/h$

$x = \frac{v}{c} = \frac{811}{2434.17} = 0.33$

$d = \frac{0.5 \times 118 \times (1 - 88/118)^2}{1 - 0.33 \times 88/118} + 900 \times 0.25 \times [(0.33 - 1) + \sqrt{(0.33-1)^2 + \frac{8 \times 0.5 \times 0.33}{2434.17 \times 0.25}}] = 5.44s$

Westbound Right Turn

$C = 118s$

$g = 88s$

$v = 73\ veh/h$

$s = 3264\ veh/h$

$c = \frac{g \cdot s}{C} = \frac{88 \times 3264}{118} = 2434.17\ veh/h$

$x = \frac{v}{c} = \frac{73}{2434.17} = 0.03$

$d = \frac{0.5 \times 118 \times (1 - 88/118)^2}{1 - 0.03 \times 88/118} + 900 \times 0.25 \times [(0.03 - 1) + \sqrt{(0.03-1)^2 + \frac{8 \times 0.5 \times 0.03}{2434.17 \times 0.25}}] = 3.92s$

Southbound Left Turn

$C = 118s$

$g = 30s$

$v = 88\ veh/h$

$s = 1581\ veh/h$

$c = \frac{g \cdot s}{C} = \frac{30 \times 1581}{118} = 401.95\ veh/h$

$x = \frac{v}{c} = \frac{88}{401.95} = 0.22$

$d = \frac{0.5 \times 118 \times (1 - 88/118)^2}{1 - 0.22 \times 88/118} + 900 \times 0.25 \times [(0.22 - 1) + \sqrt{(0.22-1)^2 + \frac{8 \times 0.5 \times 0.22}{401.95 \times 0.25}}] = 36.0s$

Southbound Right Turn

$C = 118s$

$g = 30s$

$v = 89 veh/h$

$s = 1581 veh/h$

$c = \frac{g \cdot s}{C} = \frac{30 \times 1581}{118} = 401.95 veh/h$

$x = \frac{v}{c} = \frac{89}{401.95} = 0.22$

$$d = \frac{0.5 \times 118 \times (1 - 30/118)^2}{1 - 0.22 \times 30/118} + 900 \times 0.25 \times \left[(0.22 - 1) + \sqrt{(0.22 - 1)^2 + \frac{8 \times 0.5 \times 0.22}{401.95 \times 0.25}} \right] = 36.04$$

8. NORTH 6TH STREET & SANTA CLARA STREET

Eastbound Left Turn

$C = 118s$

$g = 21s$

$v = 40 veh/h$

$s = 1652 veh/h$

$c = \frac{g \cdot s}{C} = \frac{21 \times 1652}{118} = 294 veh/h$

$x = \frac{v}{c} = \frac{40}{294} = 0.14$

$$d = \frac{0.5 \times 118 \times (1 - 21/118)^2}{1 - 0.14 \times 21/118} + 900 \times 0.25 \times \left[(0.14 - 1) + \sqrt{(0.14 - 1)^2 + \frac{8 \times 0.5 \times 0.14}{401.9 \times 0.25}} \right] = 41.82s$$

Eastbound Throughway

$C = 118s$

$g = 93s$

$v = 1165 veh/h$

$s = 1721 veh/h$

$c = \frac{g \cdot s}{C} = \frac{93 \times 1721}{118} = 1356.38$

$x = \frac{v}{c} = \frac{1165}{1356.38} = 0.86$

$$d = \frac{0.5 \times 118 \times (1 - 93/118)^2}{1 - 0.86 \times 93/118} + 900 \times 0.25 \times \left[(0.86 - 1) + \sqrt{(0.86 - 1)^2 + \frac{8 \times 0.5 \times 0.86}{1356.38 \times 0.25}} \right] = 15.45s$$

Eastbound Right Turn

$C = 118s$

$g = 93s$

$v = 80 veh/h$

$s = 1721 veh/h$

$c = \frac{g \cdot s}{C} = \frac{93 \times 1721}{118} = 1356.38 veh/h$

$x = \frac{v}{c} = \frac{80}{1356.38} = 0.06$

$d = \frac{0.5 \times 118 \times (1 - 93/118)^2}{1 - 0.06 \times 93/118} + 900 \times 0.25 \times \left[(0.06 - 1) + \sqrt{(0.06-1)^2 + \frac{8 \times 0.5 \times 0.06}{1356.38 \times 0.25}} \right] = 2.86s$

Westbound Left Turn

$C = 118s$

$g = 8s$

$v = 18 veh/h$

$s = 1652 veh/h$

$c = \frac{g \cdot s}{C} = \frac{8 \times 1652}{118} = 112.0 veh/h$

$x = \frac{v}{c} = \frac{18}{112.0} = 0.16$

$d = \frac{0.5 \times 118 \times (1 - 8/118)^2}{1 - 0.16 \times 8/118} + 900 \times 0.25 \times \left[(0.16 - 1) + \sqrt{(0.16-1)^2 + \frac{8 \times 0.5 \times 0.16}{112 \times 0.25}} \right] = 54.89s$

Westbound Throughway

$C = 118s$

$g = 80s$

$v = 779 veh/h$

$s = 3270 veh/h$

$c = \frac{g \cdot s}{C} = \frac{80 \times 3270}{118} = 2216.95 veh/h$

$x = \frac{v}{c} = \frac{779}{2216.95} = 0.35$

$d = \frac{0.5 \times 118 \times (1 - 80/118)^2}{1 - 0.35 \times 80/118} + 900 \times 0.25 \times \left[(0.35 - 1) + \sqrt{(0.35-1)^2 + \frac{8 \times 0.5 \times 0.35}{2216.95 \times 0.25}} \right] = 8.47s$

Westbound Right Turn

$C = 118s$

$g = 80s$

$v = 55 veh/h$

$s = 3270 veh/h$

$c = \frac{g \cdot s}{C} = \frac{80 \times 3270}{118} = 2216.95 veh/h$

$x = \frac{v}{c} = \frac{55}{2216.95} = 0.02$

$$d = \frac{0.5 \times 118 \times (1 - 80/118)^2}{1 - 0.02 \times 80/118} + 900 \times 0.25 \times \left[(0.02 - 1) + \sqrt{(0.02-1) + \frac{8 \times 0.5 \times 0.02}{2216.95 \times 0.25}} \right]$$

$= 6.24s$

Northbound Left Turn

$C = 118s$

$g = 17s$

$v = 82 veh/h$

$s = 1652 veh/h$

$c = \frac{g \cdot s}{C} = \frac{17 \times 1652}{118} = 238 veh/h$

$x = \frac{v}{c} = \frac{82}{238} = 0.34$

$$d = \frac{0.5 \times 118 \times (1 - 17/118)^2}{1 - 0.34 \times 17/118} + 900 \times 0.25 \times \left[(0.34 - 1) + \sqrt{(0.34-1) + \frac{17 \times 0.5 \times 0.34}{238 \times 0.25}} \right]$$

$= 49.41s$

Northbound Throughway

$C = 118s$

$g = 17s$

$v = 61 veh/h$

$s = 1624 veh/h$

$c = \frac{g \cdot s}{C} = \frac{17 \times 1624}{118} = 233.97 veh/h$

$x = \frac{v}{c} = \frac{61}{233.97} = 0.21$

$$d = \frac{0.5 \times 118 \times (1 - 17/118)^2}{1 - 0.21 \times 17/118} + 900 \times 0.25 \times \left[(0.21 - 1) + \sqrt{(0.21-1) + \frac{17 \times 0.5 \times 0.21}{233.97 \times 0.25}} \right]$$

$= 47.60s$

Northbound Right Turn

$C = 118s$

$g = 17s$

$v = 48 veh/h$

$s = 1624 veh/h$

$c = \frac{g \cdot s}{C} = \frac{17 \times 1624}{118} = 233.97 veh/h$

$x = \frac{v}{c} = \frac{48}{233.97} = 0.21$

$$d = \frac{0.5 \times 118 \times (1 - 17/118)^2}{1 - 0.21 \times 17/118} + 900 \times 0.25 \times \left[(0.21 - 1) + \sqrt{(0.21 - 1) + \frac{8 \times 0.5 \times 0.21}{233.97 \times 0.25}} \right]$$

$= 46.52 s$

Southbound Left Turn

$C = 118s$

$g = 17s$

$v = 61 veh/h$

$s = 1652 veh/h$

$c = \frac{g \cdot s}{C} = \frac{17 \times 1652}{118} = 238 veh/h$

$x = \frac{v}{c} = \frac{61}{238} = 0.26$

$$D = \frac{0.5 \times 118 \times (1 - 17/118)^2}{1 - 0.26 \times 17/118} + 900 \times 0.25 \times \left[(0.26 - 1) + \sqrt{(0.26 - 1) + \frac{17 \times 0.5 \times 0.26}{238 \times 0.25}} \right]$$

$= 47.47 s$

Southbound Throughway

$C = 118s$ $s = 1596 veh/h$

$g = 17s$

$v = 43 veh/h$

$c = \frac{g \cdot s}{C} = \frac{17 \times 1596}{118} = 229.93 veh/h$

$x = \frac{v}{c} = \frac{43}{229.93} = 0.19$

$$d = \frac{0.5 \times 118 \times (1 - 17/118)^2}{1 - 0.19 \times 17/118} + 900 \times 0.25 \times \left[(0.19 - 1) + \sqrt{(0.19 - 1) + \frac{17 \times 0.5 \times 0.19}{229.93 \times 0.25}} \right]$$

$= 46.21 s$

Southbound Right Turn

$C = 118s$

$g = 17s$

$v = 52\ veh/h$

$s = 1596\ veh/h$

$$c = \frac{g \cdot s}{C} = \frac{17 \times 1596}{118} = 229.93\ veh/h$$

$$x = \frac{v}{c} = \frac{52}{229.93} = 0.23$$

$$d = \frac{0.5 \times 118 \times (1 - 17/118)^2}{1 - 0.23 \times 17/118} + 900 \times 0.25 \times \left[(0.23 - 1) + \sqrt{(0.23 - 1) + \frac{17 \times 0.5 \times 0.23}{229.93 \times 0.25}}\right]$$

$$= 46.93s$$

Appendix C: Cost Estimation

Code	Description	Quantity	Unit	Unit Price (USD)	Total (USD)
SETION 1: SAN PEDRO STREET & SANTA CLARA STREET INTERSECTION TO NORTH MARKET STREET & SANTA CLARA STREET INTERSECTION					
840656	Traffic Strips	228	LF	1.5	342.00
995000	Bus Shelter	1	EA	10,000	10,000.00
418006	Remove Concrete Pavement	11	CY	150	1,650.00
390132	Hot Mix Asphalt	510	TON	100	51,000.00
731502	Concrete (Miscellaneous Construction)	102	CY	30	3,060.00
820860	Sign Installation	5	EA	150	750.00
SECTION 1: SUBTOTAL					66,802.00
SECTION 2: NORTH MARKET STREET & SANTA CLARA STREET INTERSECTION TO NORTH 1ST STREET & SANTA CLARA STREET INTERSECTION					
840656	Traffic Strips	82	LF	1.5	123.00
390132	Hot Mix Asphalt	972	TON	100	97,200.00
820860	Sign Installation	6	EA	150	900.00
SECTION 2: SUBTOTAL					98,223.00
SECTION 3: NORTH 1ST STREET & SANTA CLARA STREET INTERSECTION TO NORTH 2ND STREET & SANTA CLARA STREET INTERSECTION					
840656	Traffic Strips	74	LF	1.5	111.00
995000	Bus Shelter	2	EA	10,000	20,000.00
418006	Remove Concrete Pavement	22	CY	150	3,300.00
390132	Hot Mix Asphalt	640	TON	100	64,000.00
731502	Concrete (Miscellaneous Construction)	204	CY	30	6,120.00
820860	Sign Installation	8	EA	150	1,200.00
820250	Sign Demolition	1	EA	120	120.00
820610	Sign Relocation	1	EA	250	250.00
SECTION 3: SUBTOTAL					95,101.00
SECTION 4: NORTH 2ND STREET & SANTA CLARA STREET INTERSECTION TO NORTH 3RD STREET & SANTA CLARA STREET INTERSECTION					
840656	Traffic Strips	84	LF	1.5	126.00
390132	Hot Mix Asphalt	647	TON	100	64,700.00
820860	Sign Installation	3	EA	150	450.00

SECTION 4: SUBTOTAL					65,276.00
SECTION 5: NORTH 3RD STREET & SANTA CLARA STREET INTERSECTION TO NORTH 4TH STREET & SANTA CLARA STREET INTERSECTION					
840656	Traffic Strips	86	LF	1.5	129.00
390132	Hot Mix Asphalt	627	TON	100	62,700.00
820860	Sign Installation	3	EA	150	450.00
SECTION 5: SUBTOTAL					63,279.00
SECTION 6: NORTH 4TH STREET & SANTA CLARA STREET INTERSECTION TO NORTH 5TH STREET & SANTA CLARA STREET INTERSECTION					
840656	Traffic Strips	56	LF	1.5	84.00
390132	Hot Mix Asphalt	652	TON	100	65,200.00
820860	Sign Installation	1	EA	150	150.00
820610	Sign Relocation	1	EA	250	250.00
SECTION 6: SUBTOTAL					65,684.00
SECTION 7: NORTH 5TH STREET & SANTA CLARA STREET INTERSECTION TO NORTH 6TH STREET & SANTA CLARA STREET INTERSECTION					
840656	Traffic Strips	80	LF	1.5	120.00
995000	Bus Shelter	2	EA	10,000	20,000.00
418006	Remove Concrete Pavement	22	CY	150	3,300.00
390132	Hot Mix Asphalt	604	TON	100	60,400.00
731502	Concrete(Miscellaneous Construction)	204	CY	30	6,120.00
820860	Sign Installation	6	EA	150	900.00
SECTION 7: SUBTOTAL					90,840.00
SUBTOTAL					545,205.00
	Mobilization		10%		54,520.50
	Contingency		25%		136,301.25
	Labor Cost		25%		136,301.25
GRAND TOTAL					872,328.00
					873,000.00