

IMPACT OF COUNTDOWN GROUND LED LIGHTS ON TRAFFIC FLOW EFFICIENCY AT SIGNALIZED INTERSECTIONS: A DRIVING SIMULATOR STUDY

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Introduction

- Unnecessary stopping at signalized intersections during yellow interval reduces traffic flow efficiency
- Difficult to make appropriate decisions at the onset of yellow interval

Objectives

- To investigate the impact of countdown ground LED dynamic lights on traffic flow efficiency during inter-green period at signalized intersections
- The countdown system is aimed at visualizing the inter-green period by means of a countdown system

Apparatus

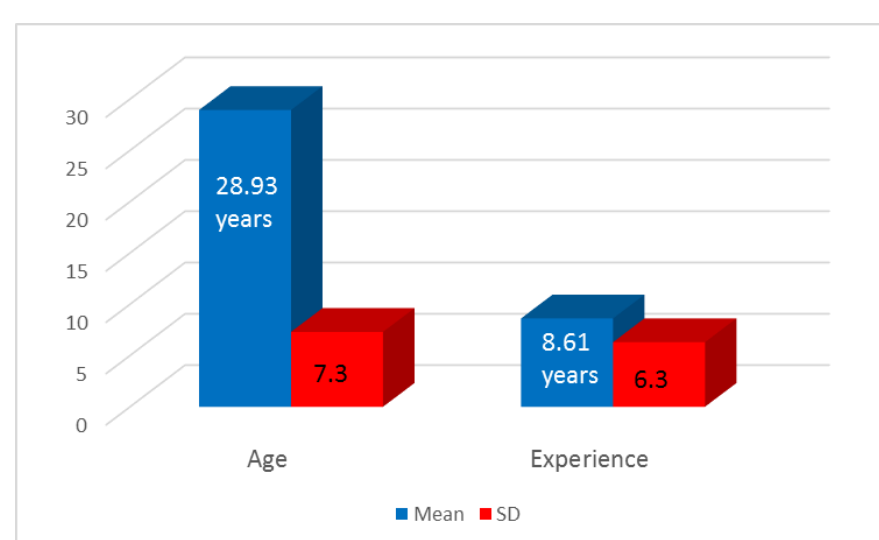
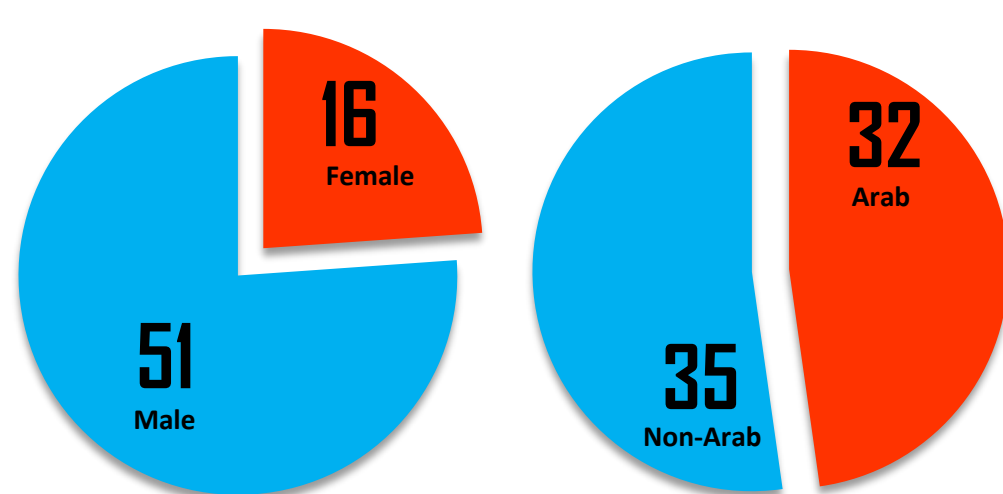
Driving simulator at QTSC was used



- 135° horizontal view
- 5760 x 1080 pixels resolution

Participants

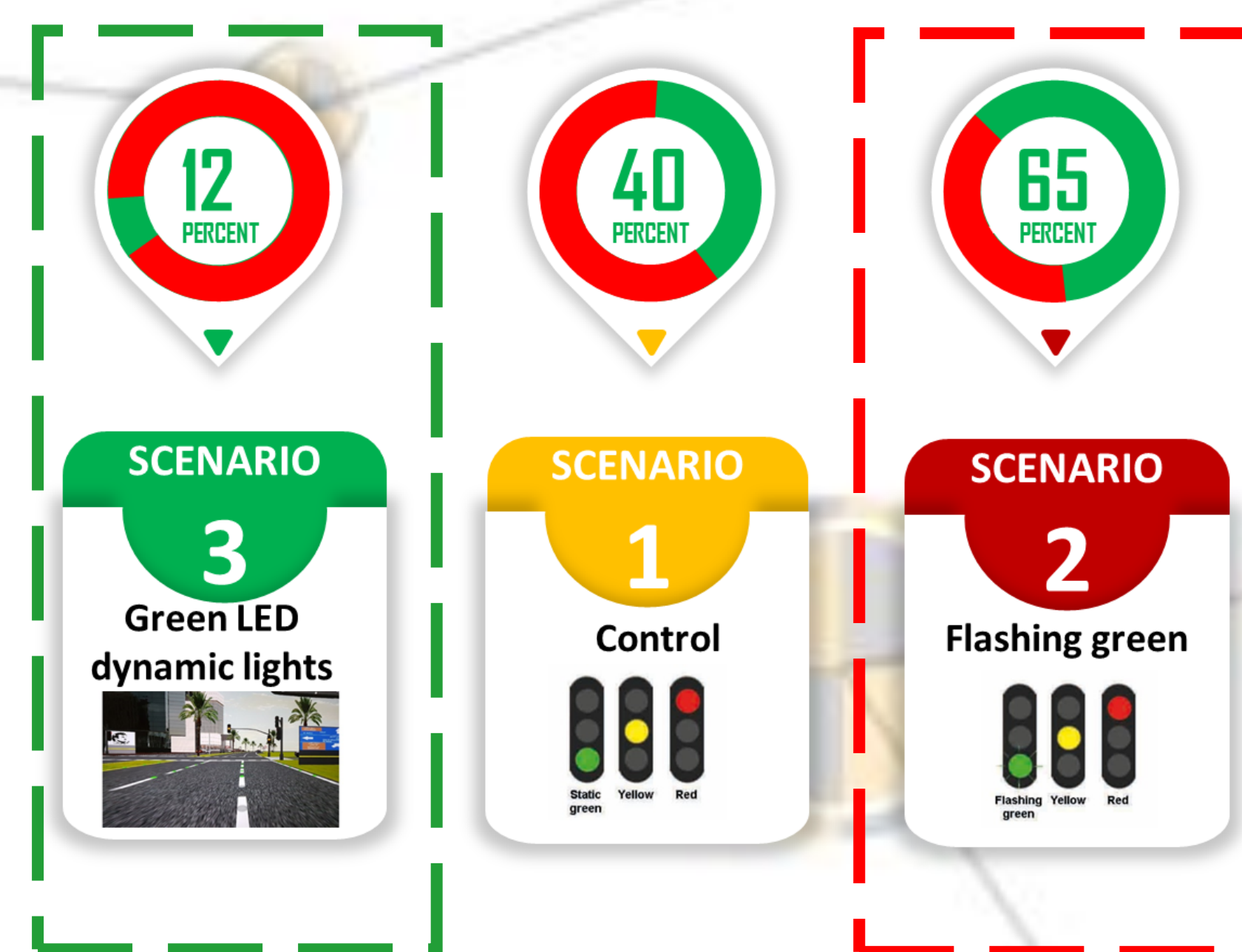
67 participants with a valid Qatari driving license



BACKGROUND

Main findings

Percentage of crossing



Best Performance

- Most of the drivers crossed
- Highest probability of crossing
- Well utilization of the inter-green period

Worst Performance

- Highest stopping occurrence
- Advance speed reduction
- Lowest probability of crossing at the intersection

CONCLUSION

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Regression analysis

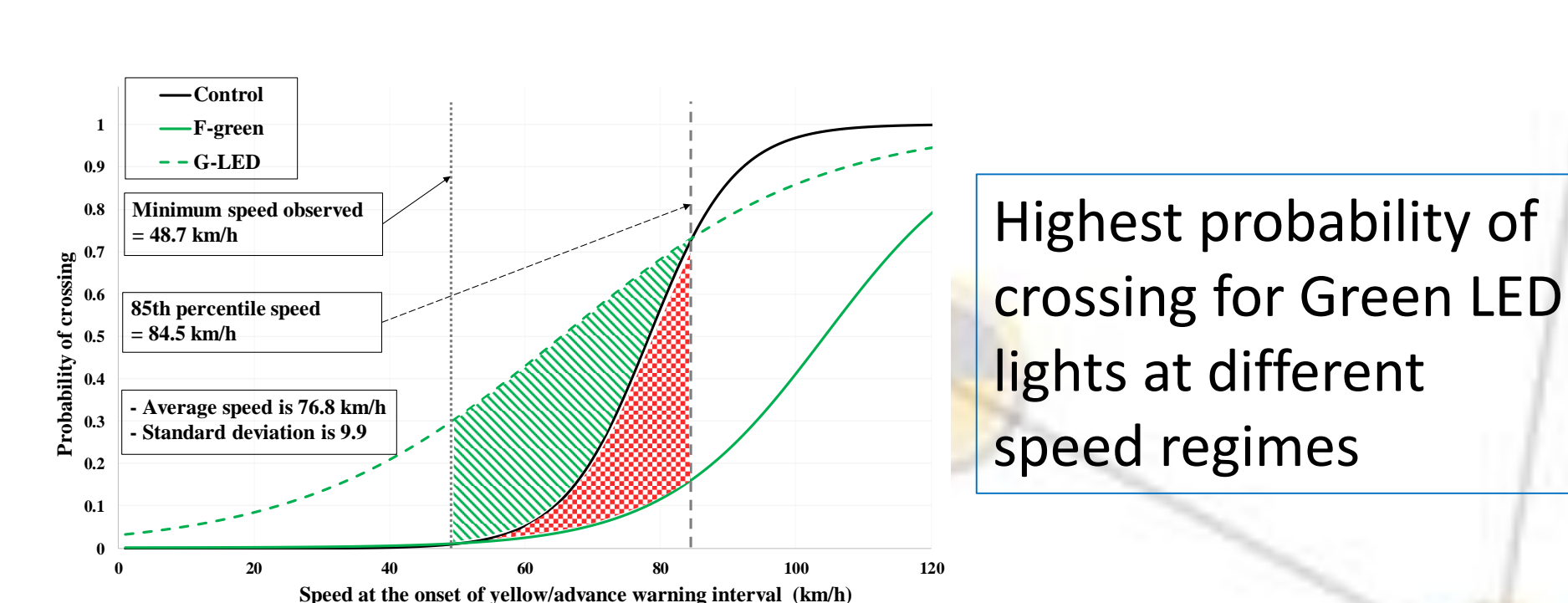
Probability of crossing the intersection

Variables	β	exp^{β}	Standard error	Wald	df	Sig.
Constant (base = Control)	-9.230	.000	2.461	14.062	1	<.001
Flashing green	-2.438	.087	.620	15.478	2	<.001
G-LED	.949	2.582	.420	5.102	1	.024
Gender (male)	-.411	.663	.488	.707	1	.400
Ethnicity (Arab)	-.328	.720	.450	.533	1	.465
^a Age	.048	1.049	.057	.726	1	.394
^b Experience	-.021	.979	.061	.119	1	.730
^c Speed	-.105	1.111	.025	17.162	1	<.001

2.5 times higher probability that a driver will cross the intersection compared to the Control scenario

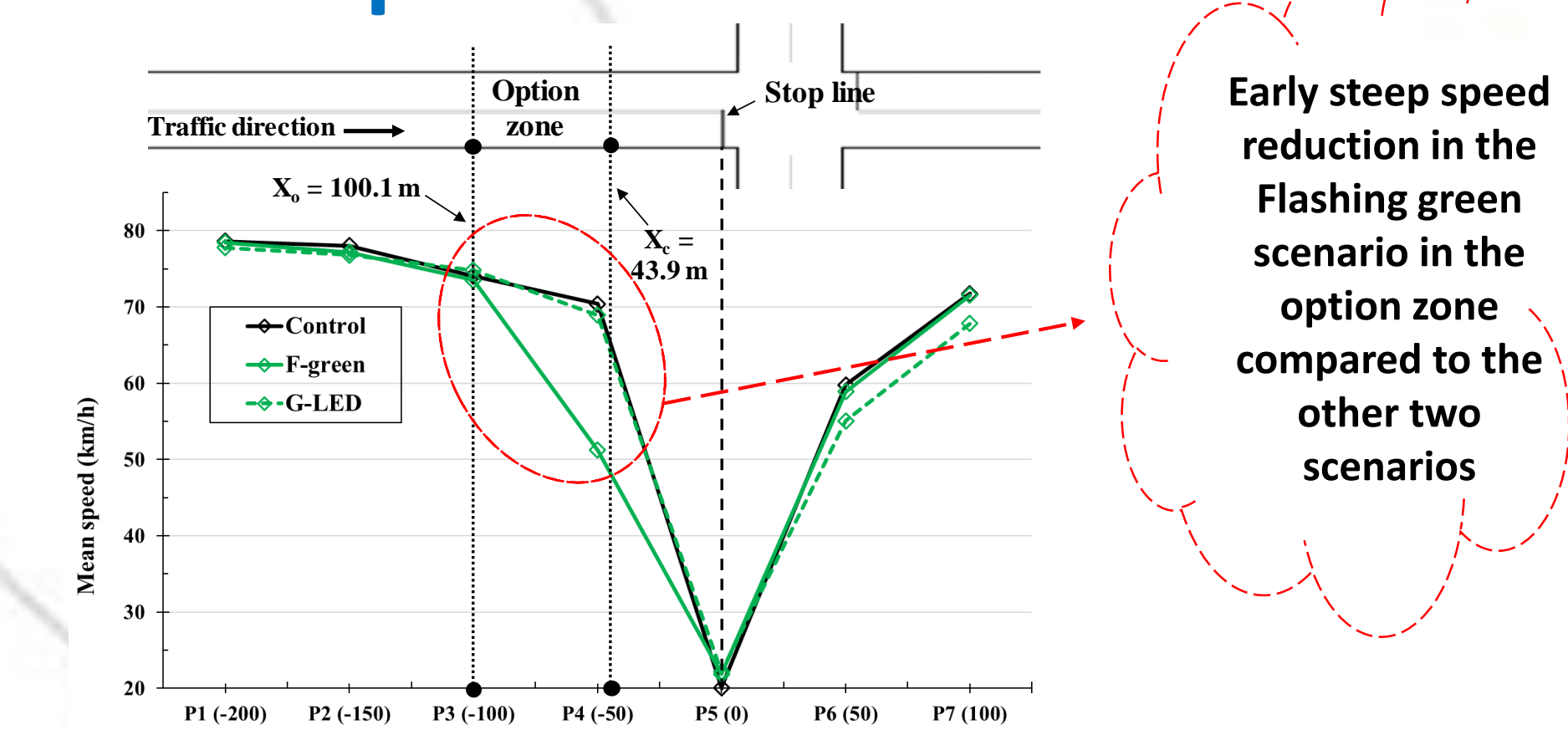
11.5 times higher probability of stopping comparing to the Control scenario

S-curves



Highest probability of crossing for Green LED lights at different speed regimes

Mean speed

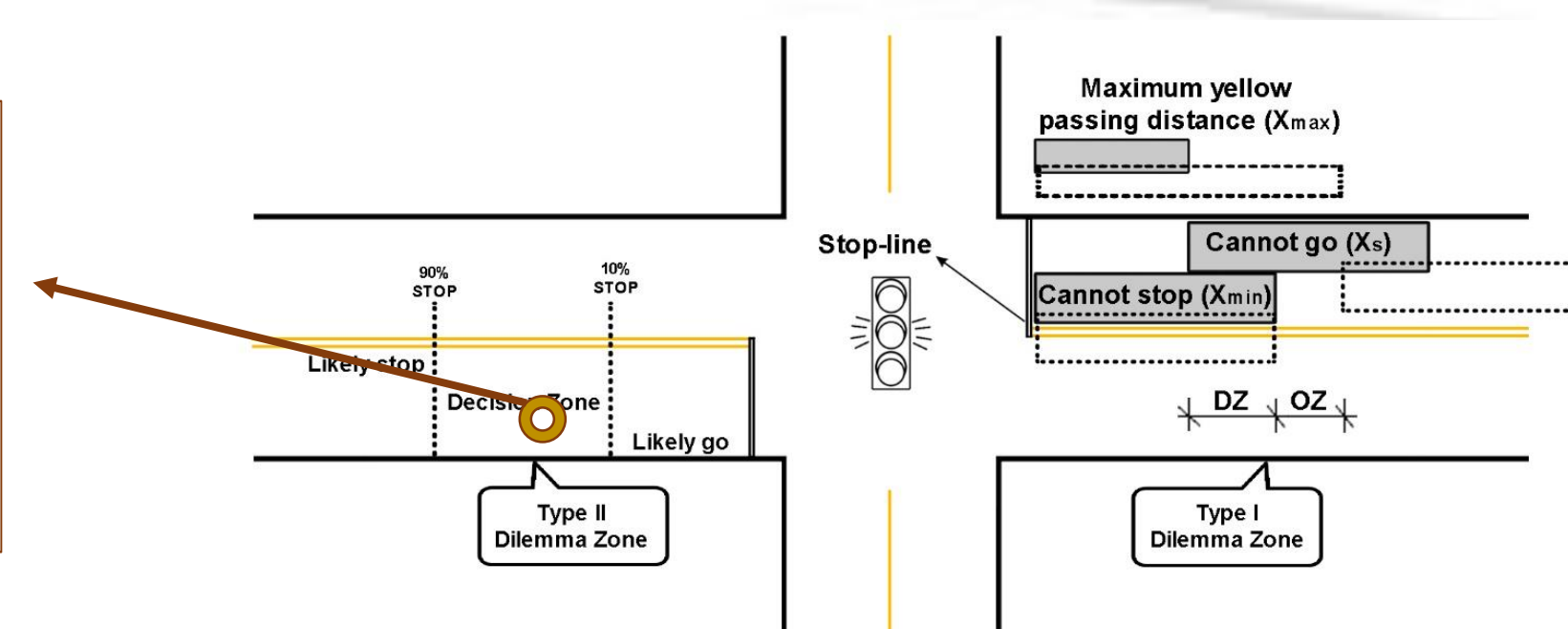


Early steep speed reduction in the Flashing green scenario in the option zone compared to the other two scenarios

STUDY DESIGN

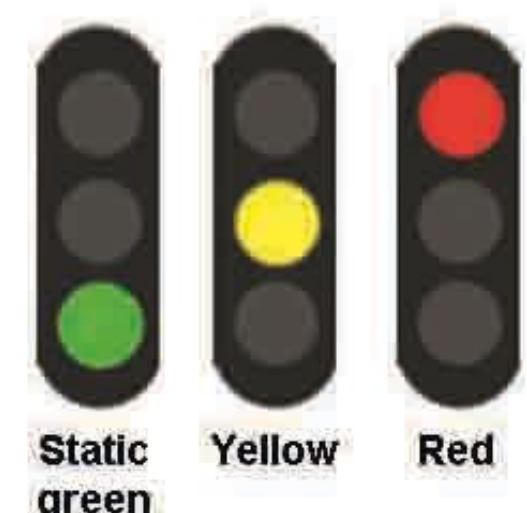
Situation

- Option zone
- At the onset of yellow interval: 65 m from the stop line
- At the onset of flashing green: 125 m from the stop line

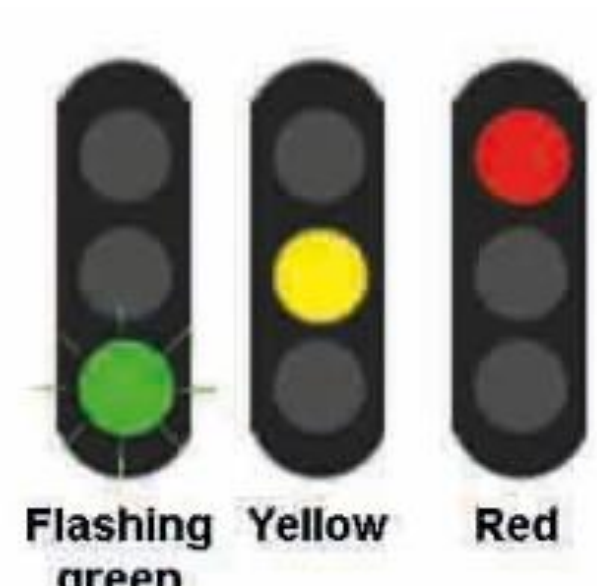


3 Scenarios

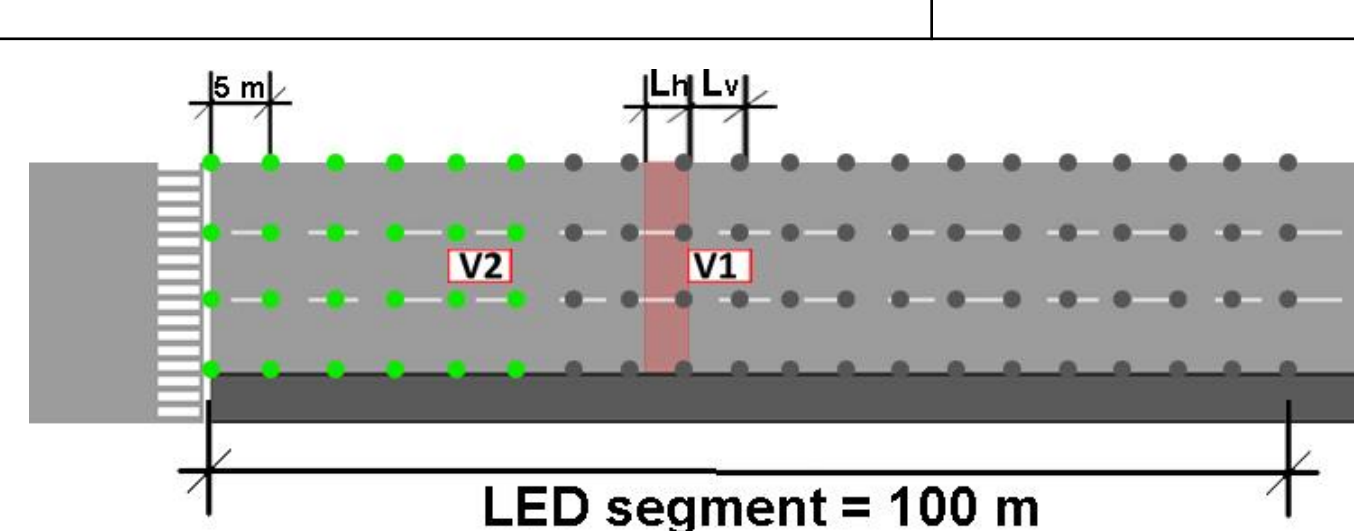
1. Control



2. Flashing green



3. Green LED lights



LED lights were turning off one by one in a sequential order with a speed of 56 kph
LED lights stretch = 100 m
Spacing between lights = 5 m

RESULTS