Technical Report

Introduction of
a New Traffic Light Signal Junction
at Hoi Wang Road and Yan Cheung Road

*Photo from Google map

https://www.google.com.hk/maps/@22.3091136,114.1649225,216m/data=!3m1!1e3?hl=en

Prepared by: PO Tin-chi (TOT/T)

Date: November 2018

Table of Content

1. Introduction

Express Rail Link – Hong Kong Section (XRL) is one of the most important railway projects among recent infrastructure projects in Hong Kong. It is the railway which connects Hong Kong with the express rail link network of mainland and provides an alternative way to visit mainland China.
After the express railway opening, traffic flows at the vicinity of the station are expected to surge and therefore, the peripheral road junctions are needed to be modified to cope with the situation.
This report will go through the process of junction performance assessment of a new junction.

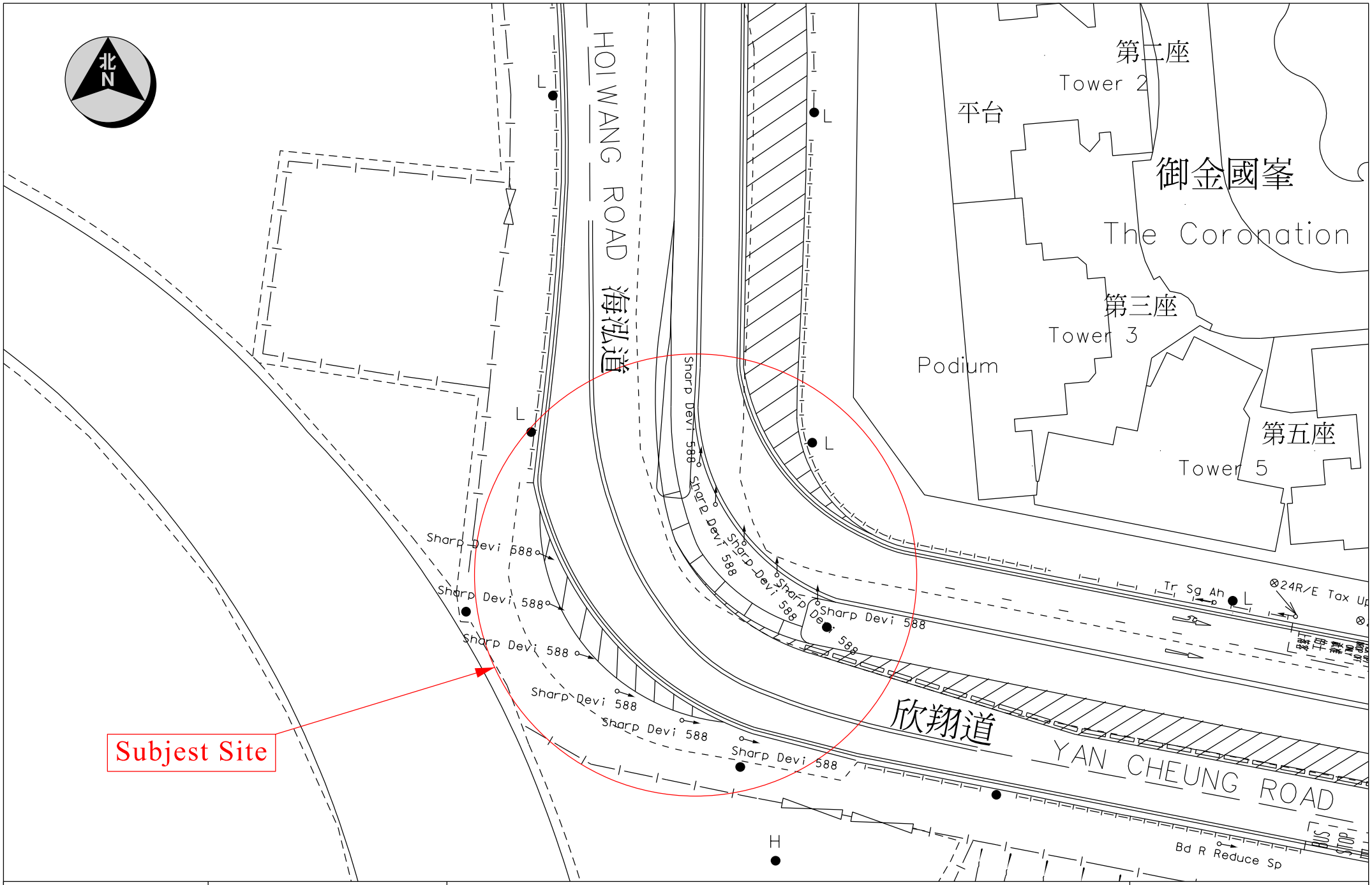
2. Site Investigation

Hoi Wang Road / Yan Cheung Road is a new junction situated near the XRL Kowloon station. Originally it was a bending road connecting Hoi Wan Road and Yan Cheung Road as shown in Figure 1.

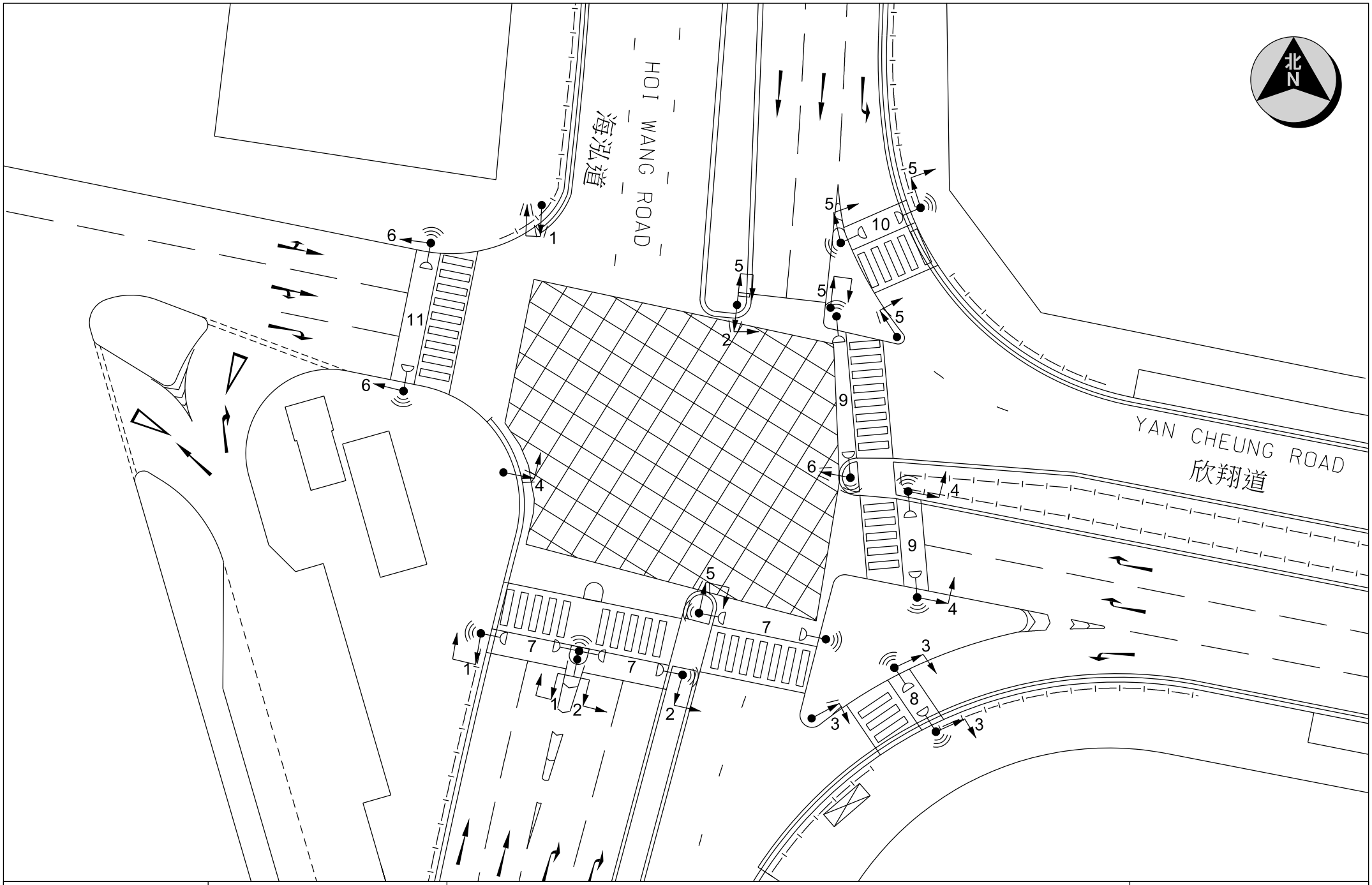
In this project, a dual carriageway, extension of Hoi Wang Road (previously named as D1A (N) Road), will be constructed to link the subject site to the XRL station. As such, a new junction will be introduced. To avoid traffic congestion induced by XRL project, junction performance assessment was carried out and alleviative measures will be made if congestion is foreseen.

As shown in Figure 1, the subject site connected Hoi Wang Road and Yan Cheung Road before modification. There is a residential development, The Coronation, next to the site. A public transport interchange (PTI) is being built on the west side while the extension of Hoi Wang Road is being constructed at the south side.
Layout of the subject site after modification is shown in Figure 2.

Figure 1



運輸署 Transport Department	TRAFFIC CONTROL (KLN.) DIV.	Title: Location of Hoi Wang Road and Yan Cheung Road	Scale: 1:500 (A4) Date: 08-04-2018



運輸署
Transport Department

TRAFFIC CONTROL
(KLN.) DIV.

Title: Layout of Proposed J/O Hoi Wang Road and Yan Cheung Road

Scale: 1:400 (A4)

Date: 08-04-2018

Figure 2

3. Methodology

3.1. Demand Flow Estimation

To assess the performance of the junction, the future demand flows have to be estimated. Modeling approach is used in this project and the traffic consultant set the design year, about 13 years from the completion of XRL, to be 2031. By inputting data of future year (employment data, household number, income…), demand flow of the design year is estimated. Figure 3 shows the demand flow of the design year by traffic consultant.

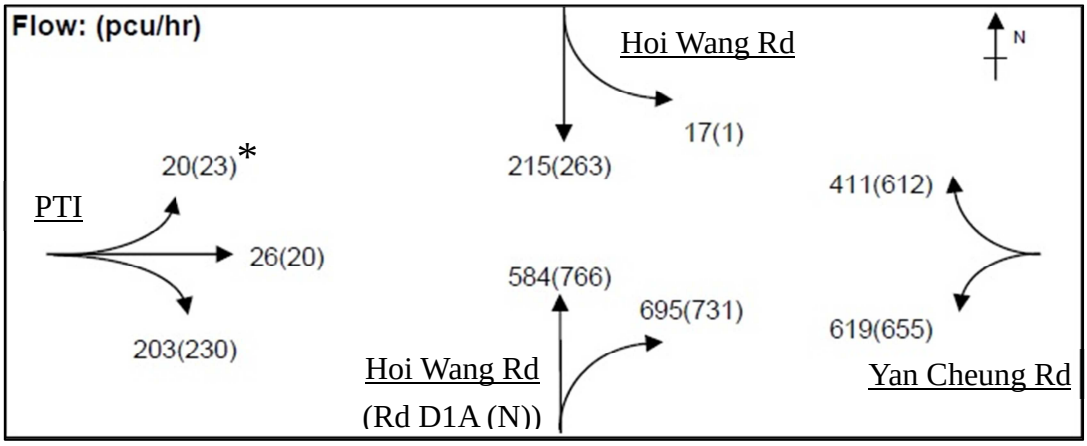


Figure 3 – Estimated Demand Flow in Design Year 2031

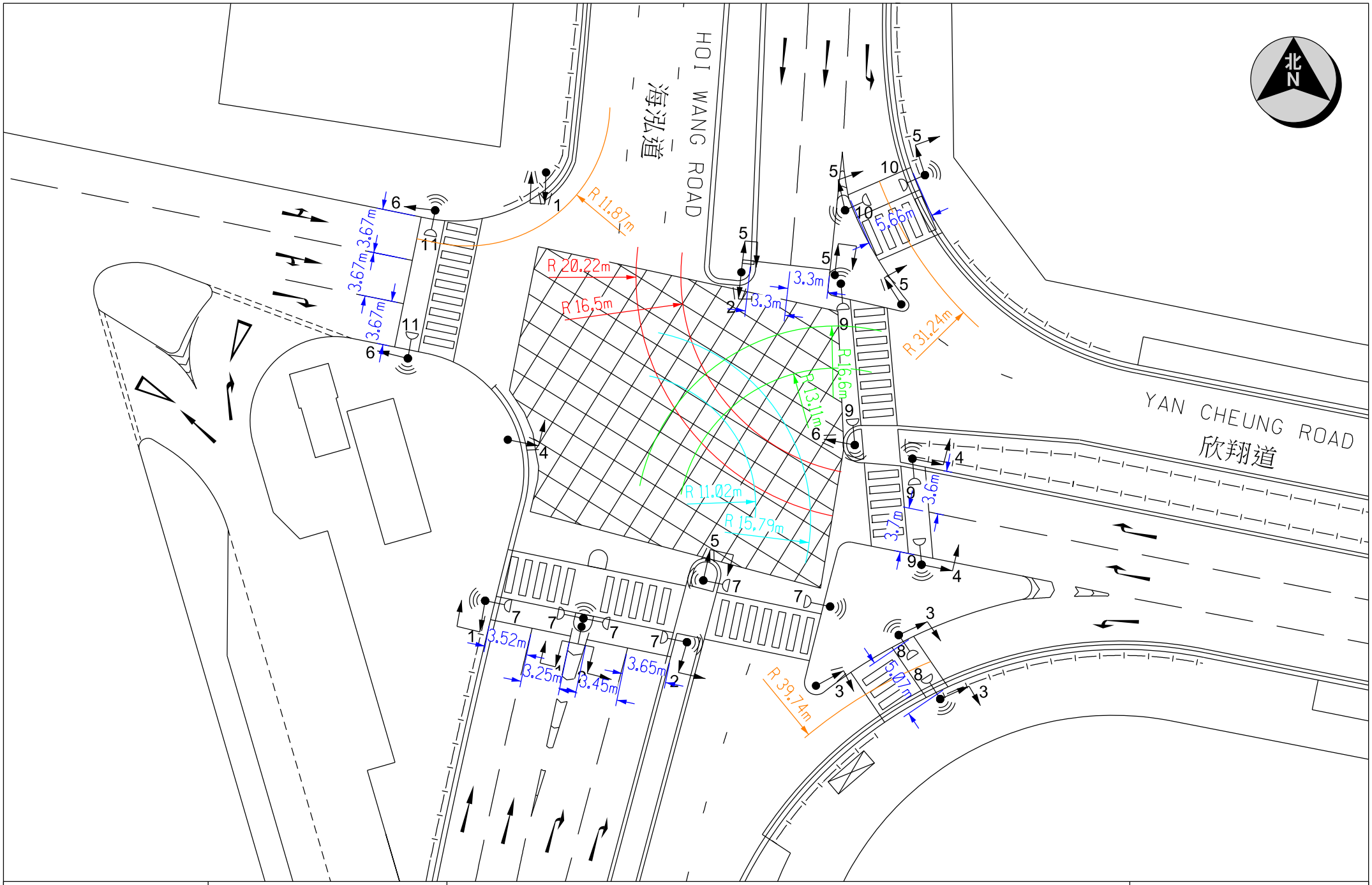
**AM flow (PM flow) in pcu/hr*

From above, the total flow of AM peak is 2790 pcu/hr while PM peak is 3301 pcu/hr. As the PM peak flow is greater, flow of PM peak is taken to calculate the reserve capacity (RC).

3.2. Saturation Flow

Other than demand flow estimation, saturation flow and lost time are also needed to be calculated in order to find out the reserve capacity for junction performance assessment.

Saturation flow of each approach of the junction depends on the geometric parameters like lane width, turn radius, proportion of turning vehicle…etc. See Figure 4 for the details of the measurements.



運輸署 Transport Department	TRAFFIC CONTROL (KLN.) DIV.	Title: Site Measurements of the Proposed New Junction	Scale: 1:400 (A4) Date: 08-04-2018

Figure 4

By putting the parameters in below equations, saturation flows are calculated.

$$S = \frac{1940 + 140N + 100(W - 3.25)}{(1 + \frac{1.5f}{r})}$$

where S is saturation flow

N = 0 for nearside lane, otherwise N = 1

W is lane width at entry in metres

r is the radius of curvature of vehicle paths in metres

f is the proportion of turning vehicles in that lane

The following table shows the saturation flow of each approach.

Movement & Phase	**Lane Width (m)**	**Turn Radius (m)**	**Saturation Flow (pcu/hr)**
Hoi Wang Road(NB) Phase 1	3.52	-	1967
	3.25		2080
Hoi Wang Road(NB) Phase 2	3.45	16.6	1926
	3.65	13.11	1777
Yan Cheung Road(WB) Phase 3	5.07	39.74	2045
Yan Cheung Road(WB) Phase 4	3.70	20.22	1978
	3.60	16.5	1810
PTI(EB) Phase 6	3.67	11.8	1878
	3.67	15.79	1938
	3.67	11.02	1745
Hoi Wang Road(SB) Phase 5	5.66	31.24	2081
	3.3	-	1945
	3.3		2085

3.3. Method of Control

The proposed method of control (MOC) by traffic consultant is 4 stages with 11 phases – 6 phases for vehicle and 5 phases for pedestrian. It is a practicable method of control but not optimal as the intergreen of this stage sequence is longer which leads to long minimum cycle time. (See Appendix 1 for detail MOC by traffic consultant)

Hence, modifications are made to shorten the minimum cycle time by switching stage sequence.

The revised MOC are shown below.

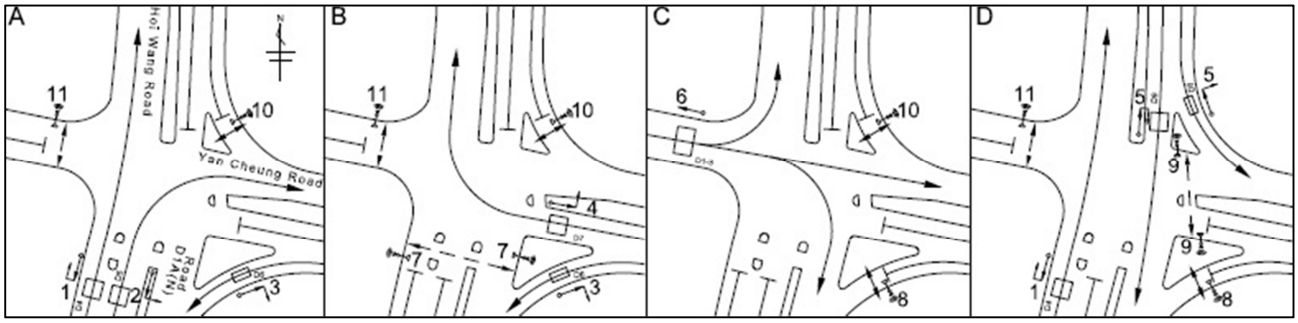


Figure 5 – Method of Control of the Proposed New Junction

After switching stage sequence, the minimum cycle time is reduced from 77 seconds to 56 seconds. (See Appendix 2 for detail MOC)

3.4. Flow Factor (y)

Dividing the estimated demand flow by the saturation flow, flow factor (y) is

By comparing the phases and stages, critical y are selected as below.

Movement & Phase	Stage	Flow Factor - y (PM)	Critical y	$\underline{Y} = \sum critical\ y$
Hoi Wang Road(NB) Phase 1	A,D	0.189	-	0.487
	A,D	0.189		
Hoi Wang Road(NB) Phase 2	A	0.198	0.198	
	A	0.197		
Yan Cheung Road(WB) Phase 3	A,B	0.320	-	
Yan Cheung Road(WB) Phase 4	B	0.162	0.162	
	B	0.161		
PTI(EB) Phase 6	C	0.023	0.062	
	C	0.062		
	C	0.062		
Hoi Wang Road(SB) Phase 5	D	0.000	0.065	
	D	0.065		
	D	0.065		

(Example of selection method: phase 3 - across stage A & B with y = 0.32 while sum of y of phase 2 and 4 - stage A & B = 0.36 > y of phase 3; phase 2 & 4 are critical rather than phase 3)

3.5. Pedestrian Phase

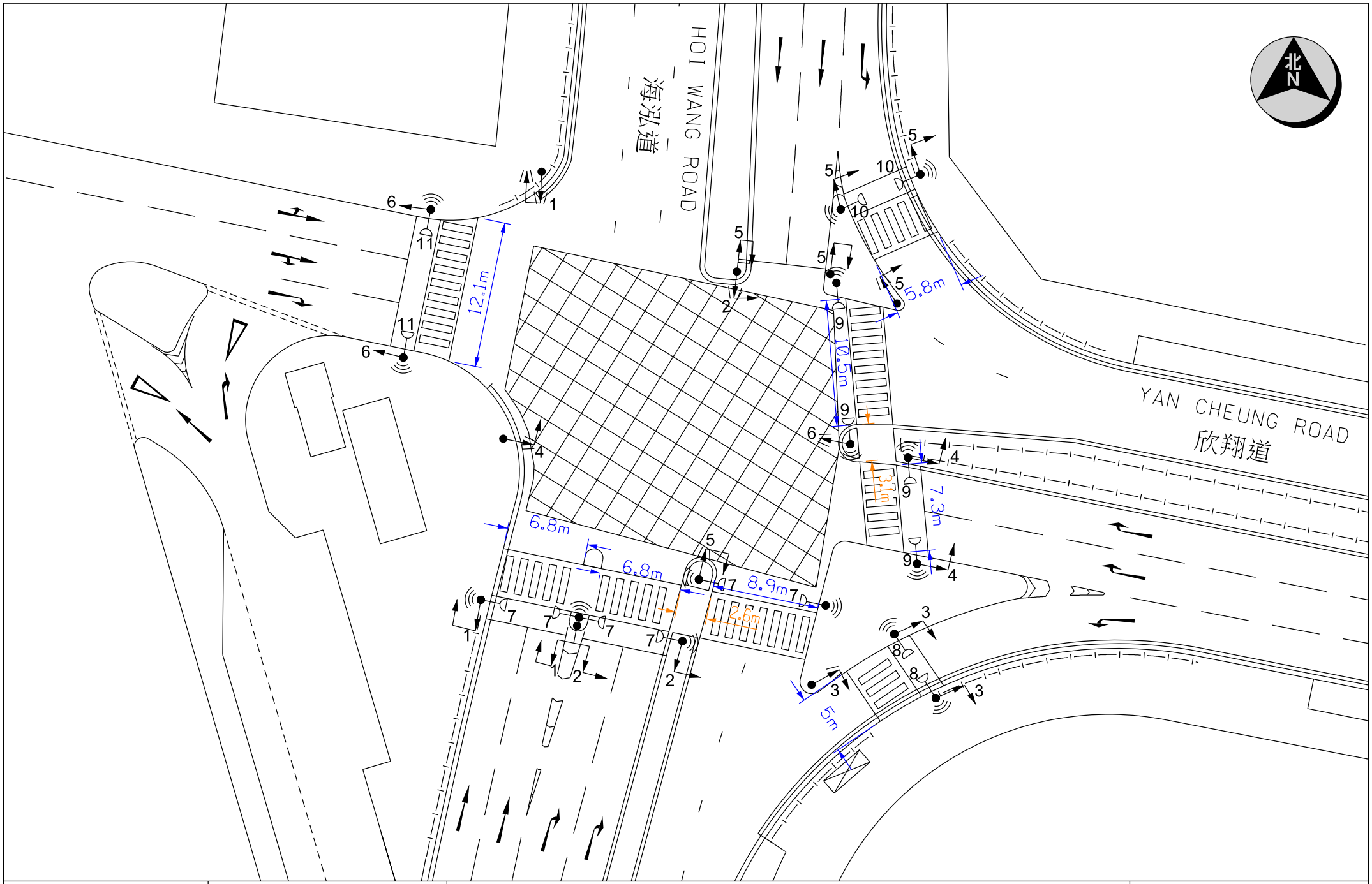
Green period and flashing green period of pedestrian phase are determined by the length of crossing and lateral width of the refuge island.

The dimensions of crossings are shown in Figure 6.

By T.P.D.M. 3.2.5.4, minimum green period of pedestrian phase is not recommended less than 5 seconds and normally minimum solid green should be:

$$Minimum\ green\ period = \frac{Greatest\ distance\ between\ kerbs + width\ of\ central\ refuge}{1.2^{\#}}$$

#assuming walking speed = 1.2m/s



運輸署 Transport Department

TRAFFIC CONTROL (KLN.) DIV.

Title: Pedestrian Crossing Dimensions of the Proposed New Junction

Scale: 1:400 (A4)

Date: 08-04-2018

Figure 6

However, minimum solid green times of pedestrian phases are set to 5 seconds by the following reasons.

- To minimize the minimum cycle time. If above formula is used, stage length will be dominated by the pedestrian phase which will increase the minimum cycle time
- Short minimum cycle time helps police to control the junction in case of congestion or traffic accident (i.e. safely change stage in short time)

It should be noted that the actual operation of the junction rarely follows the minimum cycle time. Adequate green period of pedestrian phases is assigned to ensure enough time for pedestrian.

Flashing green is decided by the following formula.

$$Flashing\ Green = \frac{Greatest\ Kerb\ to\ Kerb\ Distance}{1.2^{\#}}$$

#assuming walking speed = 1.2m/s

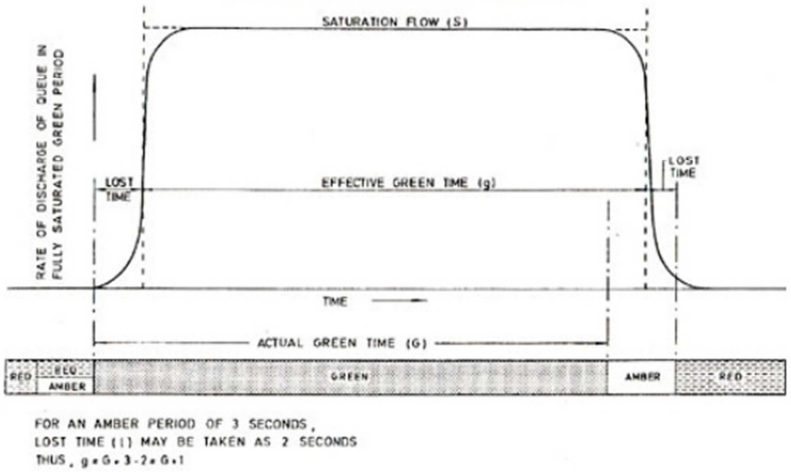
The flashing green period is listed as below.

Phase	**Greatest Kerb to Kerb Distance (m)**	**Flashing Green Required (sec)**
7	8.9	8
8	5.0	5
9	10.5	9
10	5.8	5
11	12.1	11

3.6. Lost Time (L)

Total lost time per cycle is the summation of lost times of critical phases plus other lost times due to red-amber periods, all red periods and pedestrian green and flashing green times.

DIAGRAM 2.4.1.1: VARIATION WITH TIME OF DISCHARGE RATE OF QUEUE IN A FULLY SATURATED GREEN PERIOD



(Excerpt from T.P.D.M. Vol.4 Chapter 2 – Diagram 2.4.1.1)

Lost time of a phase is found by the following equation.

$$lost\ time\ of\ a\ phase = intergreen - 1^{*}$$

**From above diagram, 1 second of the leaving amber is also counted as effective green*

By T.P.D.M. 2.3.2.6 (see Appendix 3), the intergreen between phases is decided by the difference of two conflicting movements from stop line/kerb to conflicting point.

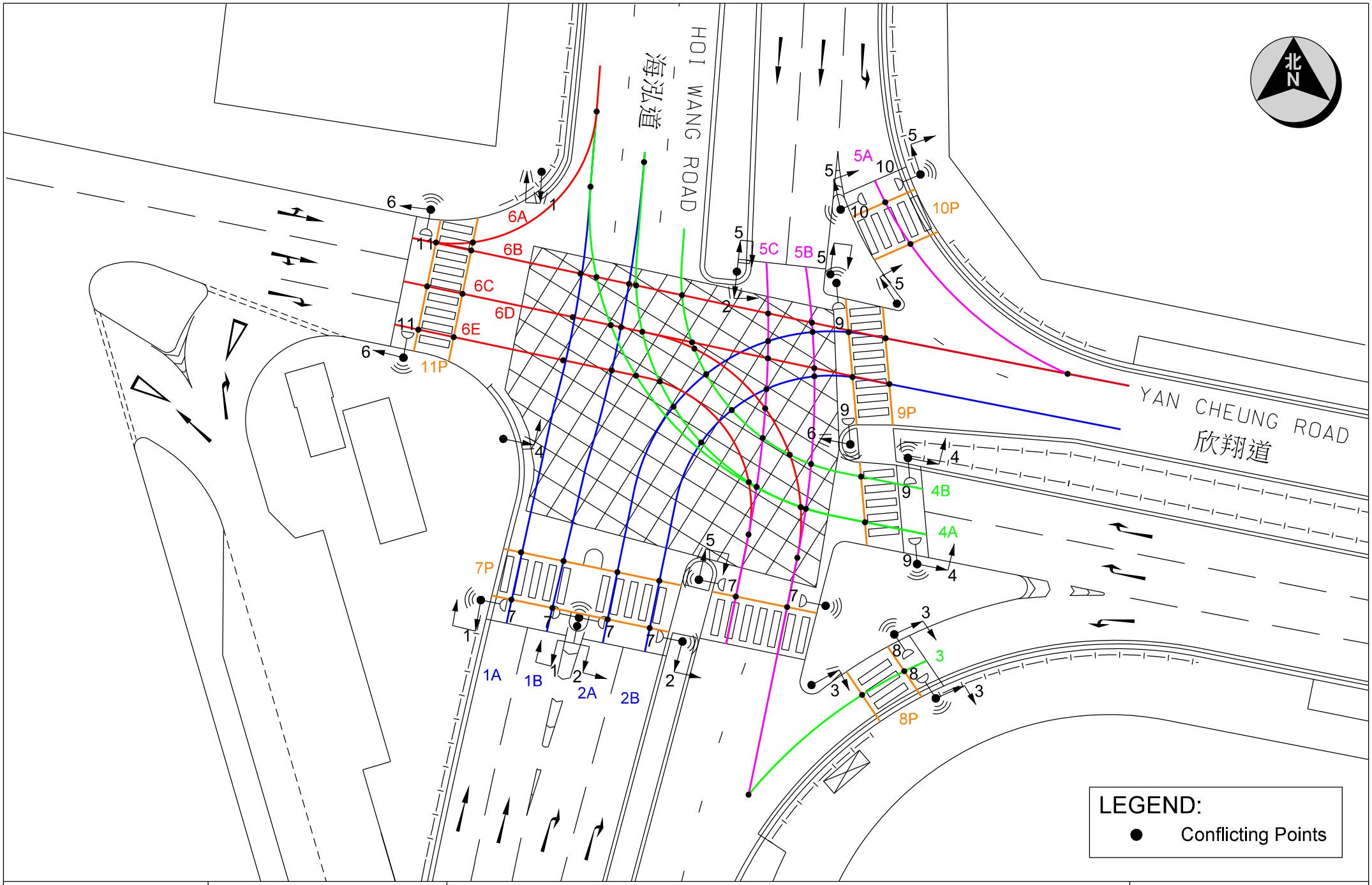
Figure 7 shows all the conflicting points of all movements.

The critical phases and intergreen required are listed below.

Stage	Phase		Distance from conflicting point (m)		Difference (m)	Direction (Ahead/Turn)	Intergreen (sec)
	Losing	Gaining	Losing	Gaining			
A to B	2	4	21.8	17.5	4.3	Turn	7*
B to C	4	6	51.2	21.2	29.9	Turn	9
C to D	6	5	55.5	23.2	32.3	Ahead	8
D to A	5	2	44.3	18.6	25.7	Ahead	7

**By measurement, intergreen between phase 2 & 4 should be 5 sec. However, phase 2 & 7 require 5 sec intergreen, 2 sec early cut off is added to phase 2 to fulfill the requirement which leads intergreen of phase 2 & 4 to become 7 sec*

Figure 7



運輸署 Transport Department	TRAFFIC CONTROL (KLN.) DIV.	Title: Conflicting Points of Movements	Scale: 1:400 (A4) Date: 08-04-2018

By the formula above and summing up the lost time of each phase, the total lost time per cycle is 27 seconds.

Please refer to Appendix 4 for details of the intergreen measurements.

Variable Intergreen

In this junction, it is noted that the demand flow of the public transport interchange is periodic. To enhance the efficiency of the junction, skipping stage C is permitted after detector loop is installed. When stage C is skipped, the stage changing sequence will be A > B > D and intergreen between stage B and D need to be measured. A variable intergreen table is prepared and shown in Figure 8.

3.7. Cycle Time (C)

After computing lost time and capacity of each approach, the optimum cycle time (Co), minimum cycle time (Cm) and practical cycle time (Cp) can be obtained by following formulas.

Optimum Cycle Time	Minimum Cycle Time	Practical Cycle Time
$C_o = \frac{1.5L + 5}{1 - Y} = 88.7\ sec$	$C_m = \frac{L}{1 - Y} = 52.7\ sec$	$C_p = \frac{0.9L}{0.9 - Y} = 58.9\ sec$

In this case, nonetheless, 120 seconds is adopted as the cycle length because the junction is not working individually. It has linking with the surrounding junctions and the cycle time has to be the same. Also, after considering the vehicle platoon at peak, 120 seconds is more adequate than C_o, C_m and C_p.

Variable Intergreen Table

JCN : 1861 Location : YAN CHEUNG ROAD / HOI WANG ROAD DS 1 : KATC / 1861 / 1A DS 2 : ATC / 1861 / 2A Date : 23.5.18

Stage Skipped	From		To		Intergreen (sec)		Remarks
	Stage	SG	Stage	SG	Required	Used	
C	B	3	D	5	5	5	SG5 CHANGES TO LS0
		3		8	5	5	
		4		1	6	6	SG4 CHANGES TO ECO0, SG1 CHANGES TO LS1
		4		5	5	5	SG4 CHANGES TO ECO0, SG5 CHANGES TO LS0
		4		9	5	5	SG4 CHANGES TO ECO0, SG9 CHANGES TO D2
		7		1	3	3	SG1 CHANGES TO LS1
		7		5	2	2	SG5 CHANGES TO LS0
		10		5	4	4	SG10 CHANGES TO D2, SG5 CHANGES TO LS0
		11		11	N/A	N/A	CONTINUE GREEN

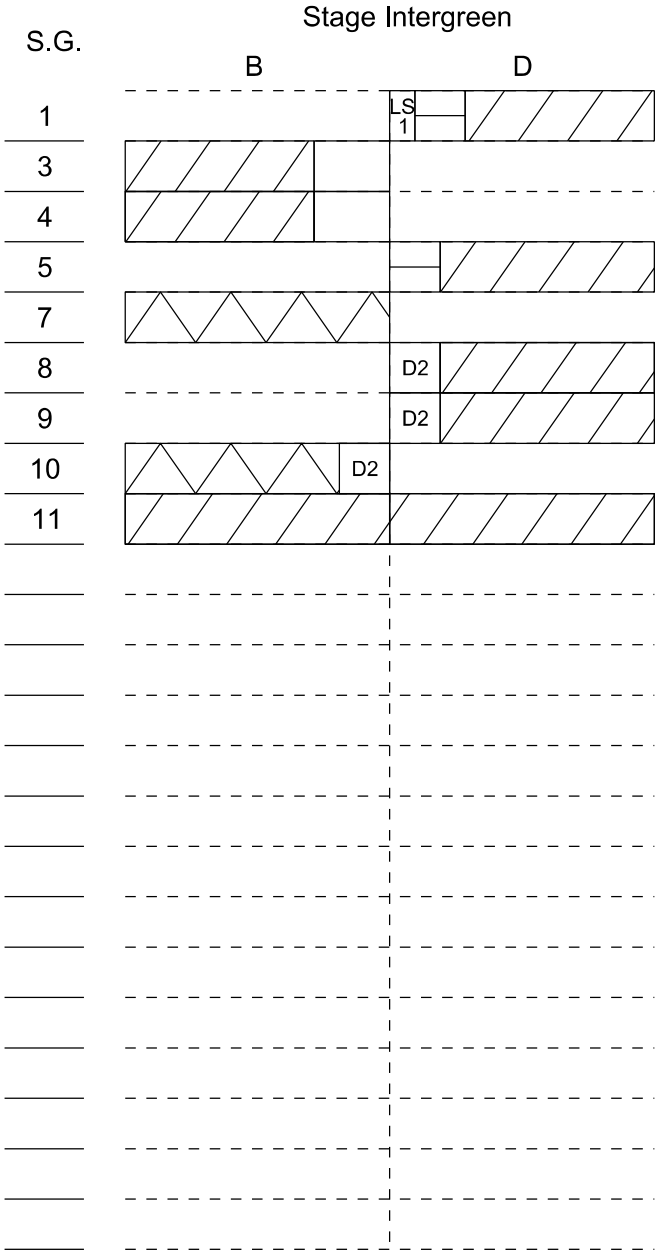


Figure 8

The green time of each stage is shown below.

Stage	**Effective Green** $[\frac{\mathbf{y}}{\mathbf{Y}}(\boldsymbol{C}-\boldsymbol{L})]$	**Green** [Effective Green − 1]	**Stage Time** [Green + Intergreen]
A	$\frac{0.198}{0.487}(120-27)=38\ sec$	$38-1=37\ sec$	$44\ sec$
B	$\frac{0.162}{0.487}(120-27)=31\ sec$	$31-1=30\ sec$	$39\ sec$
C	$\frac{0.062}{0.487}(120-27)=12\ sec$	$12-1=11\ sec$	$16\ sec$
D	$\frac{0.065}{0.487}(120-27)=12\ sec$	$12-1=11\ sec$	$21\ sec$

3.8. Reserve Capacity (RC) and Degree of Saturation

Reserve capacity, representing the capacity remained of a junction, is calculated by below formula.

$$Y_{max}=1-\frac{\mathrm{L}}{\mathrm{C}}=0.775$$

$$RC=\frac{0.9Y_{max}-Y}{\mathrm{Y}}\times 100\%$$

$$=\frac{0.9\times 0.775-0.487}{0.487}\times 100\%$$

$$=43.13\%$$

With the assigned stage time, degree of saturation of each approach can also be calculated.

Degree of saturation of each approach is summarized as below.

Movement & Phase	**Stage**	**Degree of Saturation** $[y \times \frac{C}{stage\ green\ time}]$
Wui Man Road(NB) Phase 1	A,D	0.454
	A,D	0.455
Wui Man Road(NB) Phase 2	A	0.625
	A	0.622
Yan Cheung Road(WB) Phase 3	A,B	0.557
Yan Cheung Road(WB) Phase 4	B	0.626
	B	0.624
PTI(EB) Phase 6	C	0.232
	C	0.624
	C	0.625
Hoi Wang Road(SB) Phase 5	D	0.005
	D	0.653
	D	0.652

Please see Appendix 5 for signal calculation spreadsheet.

4. Site Acceptance Test

By all the calculations above, it is found that the junction will work properly with remain capacity in the design year. Work requests will then be issued to Highway Department and other relative parties to construct the junction according to the layout.

After the construction finished, a site acceptance test will be carried out to check the followings.

1 Signal light wiring – this process checks if wiring connection is correct to the corresponding light
2 EPROM time setting – as mentioned previously, late start/early cut out will be added between phases to fulfill intergreen requirement. This process checks the correctness of time period programmed.
3 Conflict – some of the phases have conflict and should not run simultaneously. This process checks when two conflicting movements run at the same time, whether all lights will turn off or not.
4 Stage sequence – check if the stage sequence is running according to design
5 Junction facilities – check if the junction facilities like push button, detector loop, e-ATS are working properly
6 Facility switch for police – check whether the police switch on the controller is working properly

The junction is ready to be used when the site acceptance test is passed.

5. Conclusion

Introducing a traffic light signal junction at Hoi Wang Road and Yan Cheung Road is a part of the Express Rail Link – Hong Kong Section project. It helps to coordinate vehicle flows induced by XRL.

By the above calculations, it is shown that the new junction will work properly with surplus.

Photos of site visit are attached in Appendix 6.

6. Involvement

In this project, I participated mostly in the middle to end of the project. Here are some of the details.

- Intergreen Measurement – by measuring site parameters like approach width, turning radius…etc to find out the suitable interval when changing phases
- Signal Calculation – calculating the volume capacity ratio and appropriate stage time
- Data Sheet Preparation – using software Microstation to prepare Data Sheet 1, junction layout, and Data Sheet 2, details of method of control, of the junction
- Scats Data Preparation – preparing junction layout, Flexilink data in Scats for junction monitoring
- Site Acceptance Test – checking junction facilities and details on site

7. Experience Gained

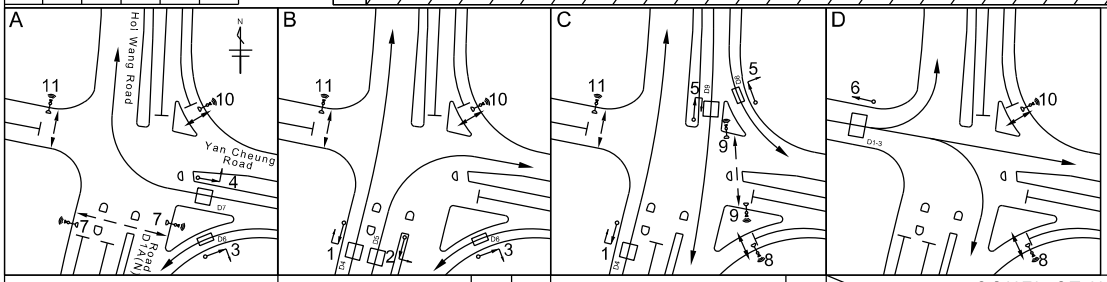
I gained a lot of knowledge about introducing a new junction in this project. From junction design to junction acceptance test, a lot of works have been done and most of them I have never tried before. With the instructions and teaching from my supervisor, I learned how to measure intergreen, plot the data sheets, how to use Scats Picture to plot junction layout, how the detector loop works, procedure of site acceptance test, and so on.

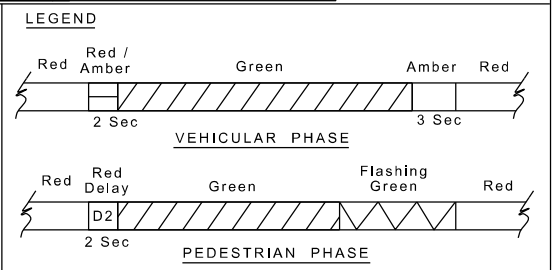
This experience helps me to understand the work of Traffic Control Division and form the basis of my future development in this division. I appreciate the patient and guide of my supervisor and colleagues.

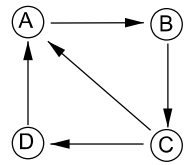
Appendices

STAGE NO.	A	B	C	D	
LATE START	6		4		
MIN. GREEN	5	5	5	5	
EARLY CUT OFF			2		
ALL RED					
MAX. GREEN	27	55	30	35	
ALT. MAX. GREEN					
SIGNAL GROUP	33	10	24	10	MINIMUM CYCLE = LENGTH 77

PED. DELAY	PED. WALK	PED. CLEAR 1	PED. CLEAR 2	MIN. GREEN	ALL RED	SIGNAL GROUP	DETECTOR NUMBER / PUSH BUTTON	DETECTOR TYPE (DEMAND, EXTENSION, QUEUE)
						1	D4	E
						2	D5	E
						3	D6	E
						4	D7	E
						5	D8-9	E
						6	D1-3	DE
10	5	15	2		1	7		
2	5	3	3		0	8		
7	5	7	5		0	9		
2	5	5	2		1	10		
2	5	12	2		1	11		







PERMITTED STAGE CHANGE

	1	2		
HURRY CALL			START - UP STAGE	A
STAGE			AUDIBLE ALARM (PART-TIME / FULL TIME)	F
DELAY			SF CONFIRM DELAY	
HOLD				
PREVENT				
REQUEST WATCHDOG				

NOTES: 1. ALL TIMING VALUES ARE IN SECONDS .
2. AUDIBLE SIGNAL OPERATES 24 HOURS

CONFLICTING SIGNAL GROUP

SIGNAL GROUP RUNNING

	1	2	3	4	5	6	7	8	9	10	11
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											

REF.	REVISION	DATE	APPR.	IMPL.
	(PROVISIONAL)			
A	MOC FOR XRL 811B	22.3.18		

TRAFFIC CONTROL DIVISION
TRANSPORT DEPARTMENT

INTERSECTION : YAN CHEUNG ROAD / HOI WANG ROAD / ROAD D1A(N)

SUB SYSTEM : 43

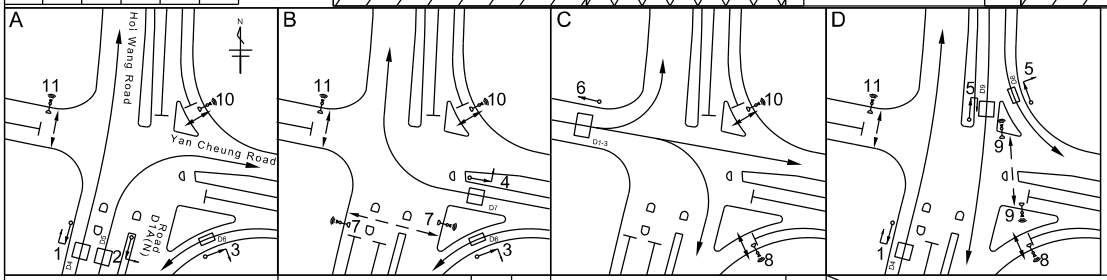
SITE ID : 0745

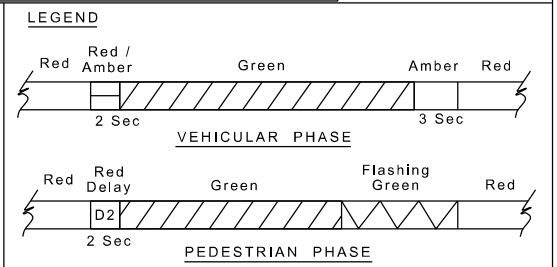
APPROVED BY : SIGNED

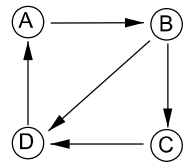
DATA SHEET : ATC / 1861 / 2 A

STAGE NO.	A	B	C	D		
LATE START				3		
MIN. GREEN	5	5	5	5		
EARLY CUT OFF	2	4		2		
ALL RED						
MAX. GREEN	35	30	20	35		
ALT. MAX. GREEN						
SIGNAL GROUP	12	14	10	20	MINIMUM CYCLE = LENGTH	56

PED. DELAY	PED. WALK	PED. CLEAR 1	PED. CLEAR 2	MIN. GREEN	ALL RED	SIGNAL GROUP	DETECTOR NUMBER / PUSH BUTTON	DETECTOR TYPE (DEMAND, EXTENSION, QUEUE)
						1	D4	E
						2	D5	E
						3	D6	E
						4	D7	E
						5	D8-9	E
						6	D1-3	DE
0	5	1	7			7		
2	5	1	4			8		
6	5	4	5			9		
2	5	2	3			10		
2	5	5	6			11		







PERMITTED STAGE CHANGE

HURRY CALL			START - UP STAGE	A
STAGE			AUDIBLE ALARM (PART-TIME / FULL TIME)	F
DELAY			SF CONFIRM DELAY	
HOLD				
PREVENT				
REQUEST WATCHDOG				

NOTES: 1. ALL TIMING VALUES ARE IN SECONDS .
2. AUDIBLE SIGNAL OPERATES 24 HOURS

CONFLICTING SIGNAL GROUP

SIGNAL GROUP RUNNING

	1	2	3	4	5	6	7	8	9	10	11
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											

REF.	REVISION	DATE	APPR.	IMPL.
A	NEW JUNCTION FOR XRL 811B	22.3.18		16.6.18

TRAFFIC CONTROL DIVISION
TRANSPORT DEPARTMENT

INTERSECTION : YAN CHEUNG ROAD / HOI WANG ROAD / ROAD D1A(N)

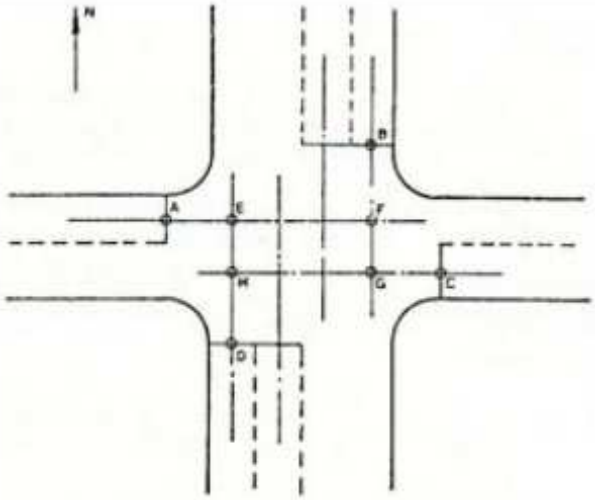
SUB SYSTEM : 43

SITE ID : 0745

APPROVED BY :

DATA SHEET : ATC / 1861 / 2 A

DIAGRAM 2.3.2.4: DETERMINATION OF INTERGREEN TIMES



Potential collision points

When East-West arms are losing right of way, if AF-BF is greater than CH-DH, then
'x' = AF-BF (or vice versa)

When North-South arms are losing right of way, if DE-AE is greater than BG-CG, then
'x' = DE-AE (or vice versa)

TABLE I AHEAD TRAFFIC

Distance 'x'(metres)	9	10-18	19-27	28-36	37-46	47-54	55-64	65-74
Intergreen (seconds)	5	6	7	8	9	10	11	12

TABLE II TURNING TRAFFIC

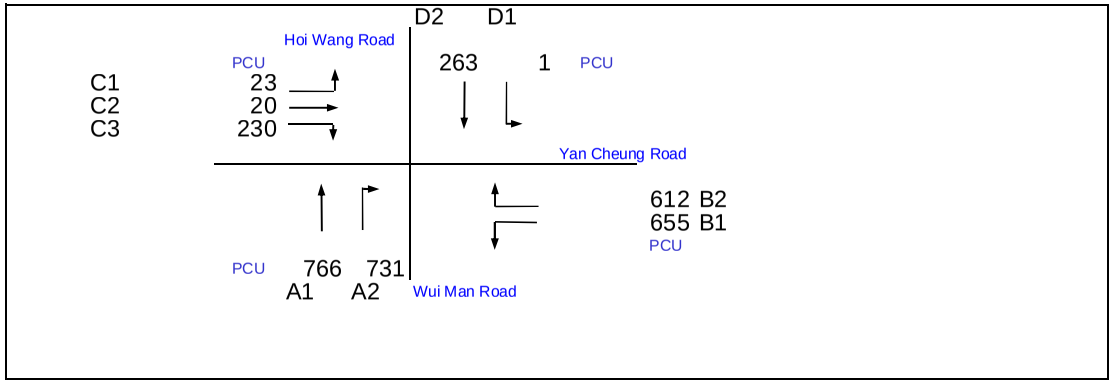
Distance 'x'(metres)	9	10-13	14-20	21-27	28-34	35-40	41-45	46-50
Intergreen (seconds)	5	6	7	8	9	10	11	12

Note : Where the following stage is a pedestrian stage, the distance "x" should be determined from the position of the pedestrian crossing. Where pedestrians are losing right of way, the start of the following stage should be delayed until the crossing area is clear.

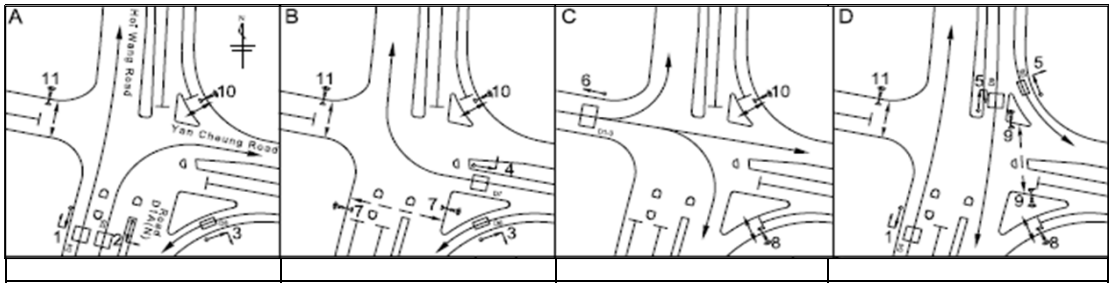
Junction	1861	Name	YAN CHEUNG ROAD/ HOI WANG ROAD		Date	23/5/2018

Stage Change		Phase Change				From (m)	To (m)	Diff. (m)	Required Time (Sec)
From	To	From	Ahead (A)/ Turning (T)	To	Ahead (A)/ Turning (T)				
A	B	1B	A	4A	T	36.25	41.72	-5.47	5
		2A	T	4B	T	24.5	21.18	3.32	5
		2B	T	4B	T	21.8	17.52	4.28	5
B	C	4A	T	6A	A	51.15	21.23	29.92	9
		4A	T	6B	A	37.36	15.61	21.75	8
		3	T	8P	A	6.04	2.32	3.72	5
		7P	A	6E	T	6.86	43.8	-36.94	5
C	D	6B	A	5A	T	55.51	23.17	32.34	8
		6B	A	5B	A	33.89	4.66	29.23	8
		6B	A	9P	A	40.13	7.86	32.27	8
		6D	T	5B	A	45.62	24.26	21.36	8
D	A	5B	A	3	T	44.33	18.64	25.69	7
		5C	A	2A	T	10.51	25.17	-14.66	5
		5A	T	2A	A	23.17	55.6	-32.43	5
B	D	4A	T	1B	A	45.29	39.83	5.46	5
		4A	T	1A	A	51.15	42.02	9.13	6
		4B	T	5B	A	9.49	16.4	-6.91	5
		3	T	8P	A	6.04	2.32	3.72	5

Transport Department - Traffic Control Division	Traffic Signal Calculation				INITIALS	DATE
JCN Name : J/O Hoi Wang Road / Yan Cheung Road	Scenario : TCD version - PM Peak	JCN No. :	1861	Prepared By:		
		DS1 Ref :		Checked By:		
		DS2 Ref:	-	Reviewed By:		



No. of stages per cycle	N =	4	
Cycle time	C =	120	sec
Sum(y)	Y =	0.487	
Loss time	L =	27	sec
Total Flow	=	3301	pcu
Co = (1.5*L+5)/(1-Y)	=	88.7	sec
Cm = L/(1-Y)	=	52.7	sec
Yult		0.698	
R.C.ult = (Yult-Y)/Y*100%	=	43.1	%
Cp = 0.9*L/(0.9-Y)	=	58.9	sec
Ymax = 1-L/C	=	0.775	
R.C.(C) = (0.9*Ymax-Y)/Y*100%	=	43.13	%



Stage	Pedestrian Phase	Crossing Width (m)	Green Time Required (s) SG	Green Time Required (s) FG	Green Time Provided (s) SG	Green Time Provided (s) FG

Move-ment	Stage	Lane Width m.	Phase	No. of lane	Radius m.	O	N	Straight-Ahead Sat. Flow	Movement Left pcu/h	Movement Straight pcu/h	Movement Right pcu/h	Total Flow pcu/h	Proportion of Turning Vehicles	Sat. Flow pcu/h				Flare lane Length m.	Share Effect pcu/hr	Revised Sat. Flow pcu/h	y	Greater y	L sec	g (required) sec	g (input) sec	Degree of Saturation X	Queue Length (m / lane)
																							27				
A11	A,D	3.52	1	1			N	1967		372		372	0.00	1967						1967	0.189	0.198		36	50	0.454	
A12	A,D	3.25	1	1				2080		394		394	0.00	2080						2080	0.189			36	50	0.455	
A21	A	3.45	2	1	16.6			2100			381	381	1.00	1926						1926	0.198			38	38	0.625	
A22	A	3.65	2	1	13.11		N	1980			350	350	1.00	1777						1777	0.197			38	38	0.622	
B1	A,B	5.07	3	1	39.74		N	2122	655			655	1.00	2045						2045	0.320	0.162		61	69	0.557	
B21	B	3.70	4	1	20.22			2125			320	320	1.00	1978						1978	0.162			31	31	0.626	
B22	B	3.60	4	1	16.5		N	1975			292	292	1.00	1810						1810	0.161			31	31	0.624	
C1	C	3.67	6	1	11.8		N	1982	23	20		43	0.53	1856						1856	0.023	0.062		4	12	0.232	
C2	C	3.67	6	1	15.79			2122		0	121	121	1.00	1938						1938	0.062			12	12	0.624	
C3	C	3.67	6	1	11.02		N	1982			109	109	1.00	1745						1745	0.062			12	12	0.625	
D1	D	5.66	5	1	31.24		N	2181	1			1	1.00	2081						2081	0.000	0.065		0	12	0.005	
D21	D	3.30	5	1			N	1945		127		127	0.00	1945						1945	0.065			12	12	0.653	
D22	D	3.30	5	1				2085		136		136	0.00	2085						2085	0.065			12	12	0.652	

NOTE : O - OPPOSING TRAFFIC N - NEAR SIDE LANE SG - STEADY GREEN FG - FLASHING GREEN PEDESTRAIN WALKING SPEED = 1.2m/s QUEUING LENGTH = AVERAGE QUEUE * 6m

Photos of Junction at Hoi Wang Road and Yan Cheung Road

Before	During Site Acceptance Test
	
Yan Cheung Road (face west)	Yan Cheung Road (face west)
	
Hoi Wang Road (face south)	Hoi Wang Road Extension (face south)
	
Subject site	Site Acceptance Test