



**Management System Document - Procedure**

**Traffic Signal Timings**

**Document reference: SQA-0645 - issue: 3**

## 1 Purpose

1.1 To describe the overall process for assessing traffic signal timings.

## 2 Background / Scope

2.1 This process applies to all traffic signal timing assessments in London.

## 3 Junctions

### 3.1 Traffic Minimums

- |  |        |
|--|--------|
| a) Traffic Phase green signal minimum                    | 7 secs |
| b) Minimum Intergreen leaving Full Traffic Phase         | 5 secs |
| c) Recommended Intergreen leaving Indicative Green Arrow | 4 secs |

### 3.2 Traffic Clearance Periods

3.2.1 In general the intergreen period shall be approximated by considering the relative transit times to the probable collision points. It should be assumed that vehicles enter the junction at a constant speed and that the probable collision points are at the intersection of the centre lines of the swept paths. Figure 1 taken from TAL01/06 demonstrates this.

3.2.2 The intergreen period can be approximated by considering the relative transit times to the probable collision points.

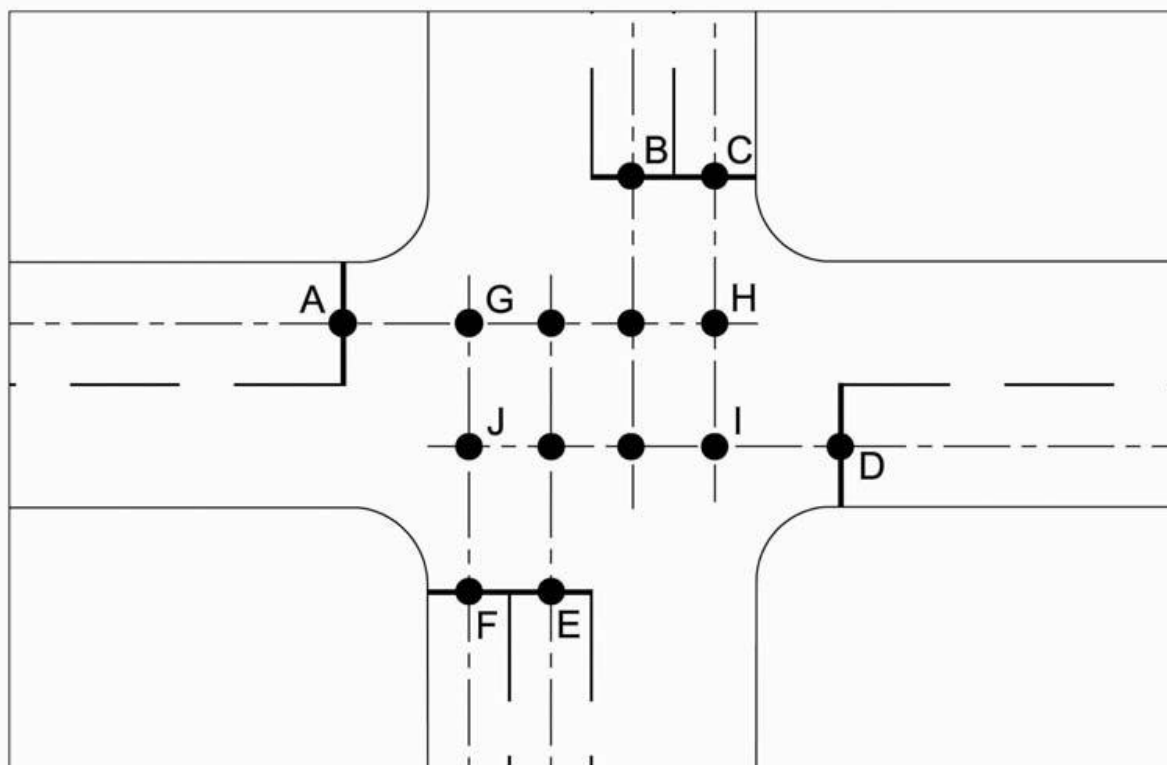


Figure 1

3.2.3 When designing a scheme the engineer shall calculate the intergreens for Traffic to Traffic and Traffic to Pedestrian conflicts via the method prescribed in TAL01/06.

3.2.4 These calculations will provide “x” distances, which equate to the distance from the stopline of the phase losing right of way to the conflict point minus the distance from the stopline or traffic waiting point (in the case of an indicative arrow) of the phase gaining right of way to the conflict point. This distance can be translated into an intergreen time via the tables that make up figure 2 and 3.

3.2.5 Where the traffic losing right of way is ahead traffic -

“x” distance	0-9	10-18	19-27	28-37	38-46	47-55	56-64	65-73
Intergreen	5	6	7	8	9	10	11	12

Figure 2

3.2.7 Where the traffic losing right of way is turning traffic -

“x” distance	0-9	10-13	14-20	21-27	28-34	35-40	41-45	46-50
Intergreen	5	6	7	8	9	10	11	12

Figure 3

3.2.8 Where the following stage is a pedestrian stage the distance “x” should be determined from the position of the furthest studs of the pedestrian crossing.

3.2.9 Where there is a considerable distance between a pedestrian facility and the conflicting traffic stopline; consideration should be given to reducing the intergreen following the pedestrian phase to take this travelling time into account. Calculations regarding such reductions must be documented, accepted by the Stage 2 Design/Safety Check and confirmed by a Team Leader or the Chief Engineer Signals before they are adopted for the design.

3.2.10 In the instance where the junction is on a road that has a speed limit over 30mph and Speed Assessment has not been used 2 seconds should be added on to each calculated intergreen.

3.2.11 Calculating the “x” value on paper when designing a scheme will not always take account of specific junction characteristics. The tables in figure 1 and 2 should be used with caution. Following a commissioning the engineer should always observe the junction at an appropriate time of day to ensure that intergreen times measured allow sufficient clearance. Intergreens may need to be increased from the values calculated on paper. Possible reasons for increasing the intergreen may, but not exclusively include.

- a) Opposed right turning vehicles being slow to move out of the junction.
- b) A high proportion of cycles needing more time to clear the junction
- c) An approach with a steep incline that has predominantly slow moving vehicles using it.

- 3.2.12 In the instance where an intergreen increase is appropriate at only specific times of day an all red extension may be used.
- 3.2.13 Any intergreen changes made in RAM following a commissioning must be followed up with a revised PROM.
- 3.2.14 Where pedestrians are losing right of way, the figures in Traffic Advisory Leaflet 5/054, "Pedestrian Facilities at Signal-controlled Junctions", should be used to calculate the clearance.
- 3.2.15 The probable vehicular collision points for a typical junction are shown in Figure 1. Following the east-west stage J and H and G and I are the collision points of concern following the north-south stage.
- 3.2.16 To calculate the clearance periods, measure the extra distance travelled to the probable collision points by vehicles losing right-of-way compared with those gaining right-of-way and call the longest distance x.
- 3.2.17 For example if  $AH - CH = 6\text{m}$  and  $DJ - FJ = 8\text{m}$  then  $x = 8\text{m}$ . If x is up to 9m then the minimum intergreen period following the east-west phase should be satisfactory but for distances over 9m the times given in the Table should be used. Repeat for every possible phase change.
- 3.2.18 The distance x may be negative and intergreen times lower than that shown in the Table can be used with caution.
- 3.2.19 The following advice applies in either case.
- 3.2.20 If vehicle speeds on the phase losing right-of-way are substantially less than on the phase gaining right-of-way, possibly because of a steep incline on the approach or a predominance of slow-moving vehicles, the intergreen should be increased. An example may be in determining an intergreen involving opposed right turning vehicles, which are normally slower and may be late starting.
- 3.2.21 This is particularly important when the move is followed by a pedestrian phase. In such cases, after measuring the difference in swept path length and applying the guide below, it is normal to add 1, or possibly 2 seconds or if necessary all red extension.

### 3.3 Pedestrian Invitation Time

3.3.1 The minimum Green Man Invitation periods are as follows:

- |    |  |           |
|----|--|-----------|
| a) | Minimum far-side green man signal (TAL5/05)  | 6-12 secs |
| b) | Minimum near-side green man signal (TAL5/05) | 4-9 secs  |

3.3.2 Depending on junction characteristics the Green-Man invitation period for signal controlled junctions may need to be increased. The engineer should always consider the following statement (from TAL05/05) when determining the appropriate green Green-Man time for a junction.

'Pedestrian timings should enable waiting pedestrians (who commence their crossing at some point during the invitation period) to cross the carriageway in a single movement, without stopping or turning back.

Waiting pedestrians are further defined as the standing queue of pedestrians as observed at the start of the green-man'

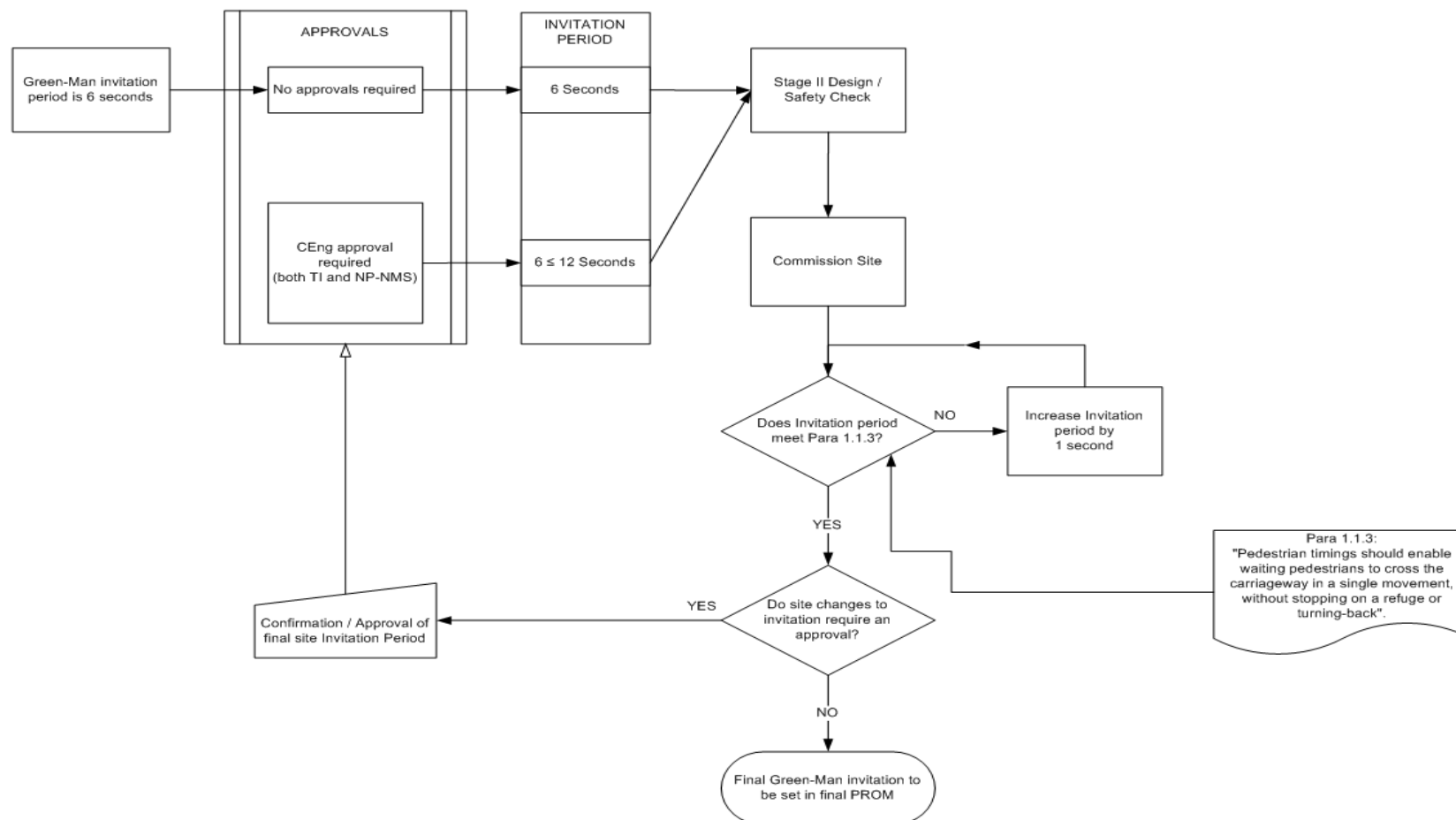
3.3.3 Figure 4 and 5 show the process maps that are to be followed when determining the green-man invitation period for existing sites, if the timings are to be increased above the minimum period.

3.3.4 Figure 4 relates to far-sided aspects and Figure 5 relates to near-sided pedestrian aspects.

3.3.5 Where there is a considerable distance between a pedestrian facility and the conflicting traffic stopline; consideration should be given to reducing the intergreen following the pedestrian phase to take into this travelling time into account. Calculations regarding such reductions must be documented, accepted by the Stage 2 Design/Safety Check and confirmed by a Team Leader or the Chief Engineer Signals before they are adopted for the design.

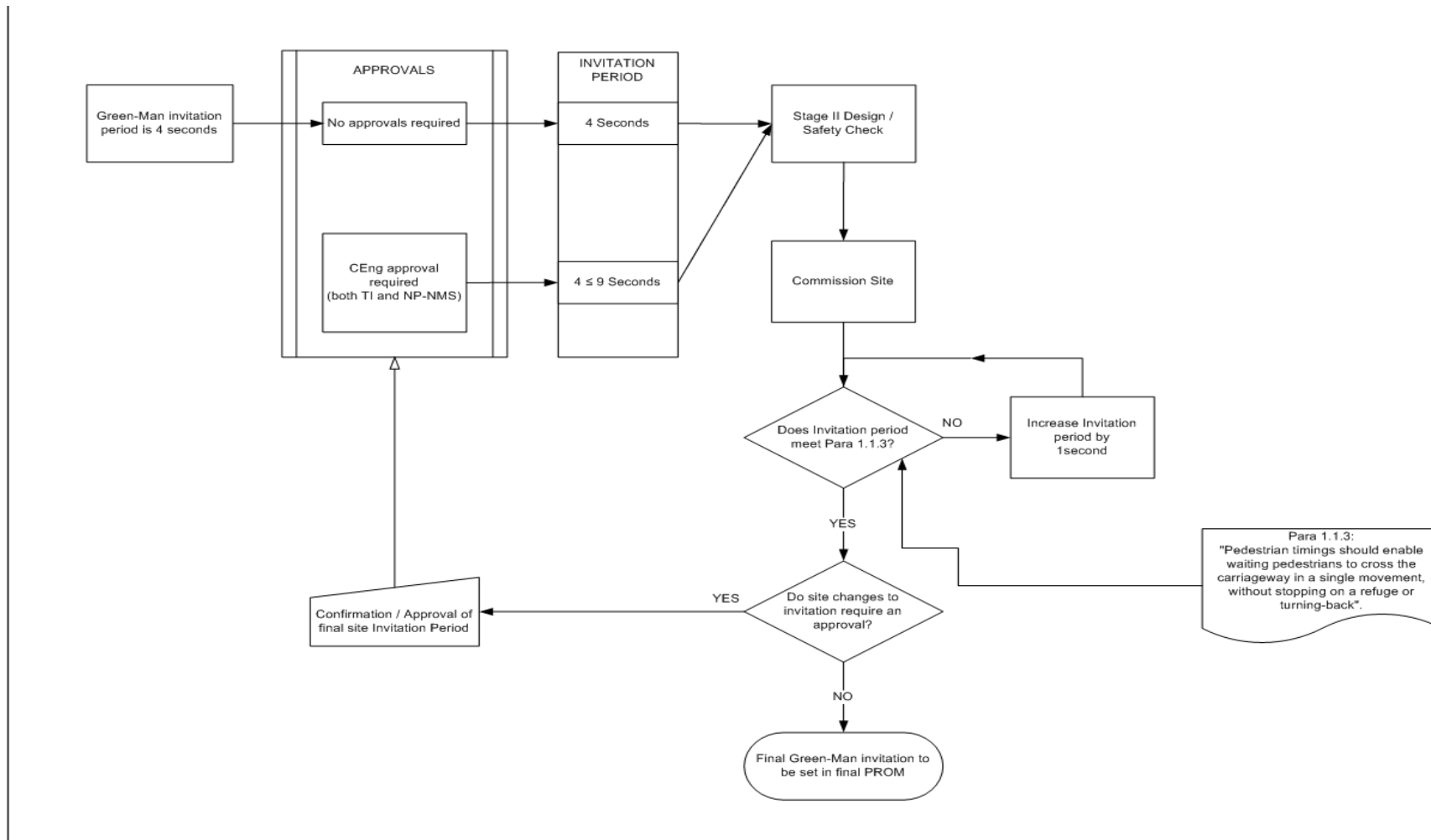
**Figure 4 – Process Map for far-sided signal installations.**

This is for junctions and Ped-X Crossings



**Figure 5 – Process Map for Near-sided signal installations**

This is for Junctions and all types of near sided stand alone crossings



### 3.4 Pedestrian Clearance Periods

- 3.4.1 Pedestrian Clearance Timings are based upon pedestrians being able to safely complete the crossing if they stepped off the kerb just before the Green Man is extinguished.
- 3.4.2 At all junctions, the total clearance time is calculated by dividing the Crossing Distance by the walking speed which has been determined to be 1.2m/s. This is defined in TAL5/05 part 4
- 3.4.3 The Clearance Time is made up of 3 distinct periods defined in TAL 05/05 part 4. Proportion of time allocated and appearance of these periods can differ depending on the type of pedestrian facility on the junction. The types of facility are
- a) Far-sided junction
  - b) Far-sided junction with countdown
  - c) Near-sided junction,
- 3.4.4 A full explanation for each facility can be found in the relevant sections of this document.
- 3.4.5 In all types of facility the third period is the Starting Amber Period which is fixed at 2 seconds, and is not included in calculating the Pedestrian clearance timings, but is added to these periods to determine the total intergreen following the pedestrian phase.
- 3.4.6 Hence Intergreen following Pedestrian Phase =  $(\text{Crossing Distance}/1.2) + 2$  seconds.

### 3.5 Junctions with Far-sided Pedestrian Aspects

- 3.5.1 The first two clearance periods of a junction with far sided facilities are
- a) Black Out
  - b) Red Man
- 3.5.2 For Junctions standard Far-sided signal junctions, the Black-Out is determined to ensure a pedestrian is able to cross at least 60% of the crossing distance before the Red Man is illuminated. This is so that the pedestrian:
- a) Establishes them self onto the crossing, does not turn round when the red man is illuminated, but continues to complete the crossing
  - b) Is able to proceed past any central refuge island which has been provided and does not wait at this location, but continues to complete the crossing.



Calculation of pedestrian timings at junction's far-sided

Road Width (metres)	Invitation Green Man (Minimum)	Clearance		Starting Amber	Total Clearance
		Blackout	All red*		
<u>Standard</u>					
up to 7.2	6	3	3	2	8
7.2 - 8.4	6	4	3	2	9
8.4 - 9.6	6	4	4	2	10
9.6 – 10.8	6	5	4	2	11
10.8 – 12.0	6	5	5	2	12
12.0 – 13.2	6	6	5	2	13
13.2 – 14.4	6	6	6	2	14
14.4 – 15.6	6	7	6	2	15
15.6 – 16.8	6	7	7	2	16
16.8 – 18.0	6	8	7	2	17
18.0 – 19.2	6	8	8	2	18
19.2 – 20.4	6	9	8	2	19
20.4 – 21.6	6	9	9	2	20
21.6 – 22.8	6	10	9	2	21
22.8 – 24.0	6	10	10	2	22

Figure 6

Calculation of pedestrian timings at junctions with countdown units

Road Width (metres)	Invitation Green Man (Minimum)	Clearance		Starting Amber	Total Clearance
		Blackout	All red*		
<u>Standard</u>					
up to 7.2	6	3	3	2	8
7.2 - 8.4	6	4	3	2	9
8.4 - 9.6	6	5	3	2	10
9.6 – 10.8	6	6	3	2	11
10.8 – 12.0	6	7	3	2	12
12.0 – 13.2	6	8	3	2	13
13.2 – 14.4	6	9	3	2	14
14.4 – 15.6	6	10	3	2	15
15.6 – 16.8	6	11	3	2	16
16.8 – 18.0	6	12	3	2	17
18.0 – 19.2	6	13	3	2	18
19.2 – 20.4	6	14	3	2	19
20.4 – 21.6	6	15	3	2	20
21.6 – 22.8	6	16	3	2	21
22.8 – 24.0	6	17	3	2	22

Figure 7

3.6 Junctions with Near-sided Pedestrian Aspects.

3.6.1 For near-sided facilities without Central Refuges there is no Black-Out period. The clearance period is configured for the following:

- a) Red Man
- b) Extension to Red Man

3.6.2 The Red Man is illuminated for a standard 3 seconds after the Green Man is extinguished.

3.6.3 The Maximum extension time is determined by the distance/1.2ms.

Calculation of pedestrian timings at junctions near sided

Road Width (metres)	Invitation Green Man (Minimum)	Clearance		Starting Amber	Total Maximum Clearance
		Minimum Red Man Period	Maximum Extendable Red Man Period		
<u>Standard</u>					
up to 7.2	4	3	6	2	11
7.2 - 8.4	4	3	7	2	12
8.4 - 9.6	4	3	8	2	13
9.6 – 10.8	4	3	9	2	14
10.8 – 12.0	4	3	10	2	15
12.0 – 13.2	4	3	11	2	16
13.2 – 14.4	4	3	12	2	17
14.4 – 15.6	4	3	13	2	18
15.6 – 16.8	4	3	14	2	19
16.8 – 18.0	4	3	15	2	20
18.0 – 19.2	4	3	16	2	21
19.2 – 20.6	4	3	17	2	22

Figure 8

## 4 Stand-alone Crossings

### 4.1 Pelican Timings

#### 4.1.1 Period Timings

Period 1	Red Man - Green	20 seconds (FVP) 20 seconds max, 7 seconds min (VA)
ALT Period 1 (where dual VP required) 7 - 20 seconds		
Period 2	Red Man - Amber	3 seconds - mandatory
Period 3	Red Man - Red	2 seconds - gap change 2 seconds - max change 2 second - fixed time 3 seconds - SDE change 2 second - computer change

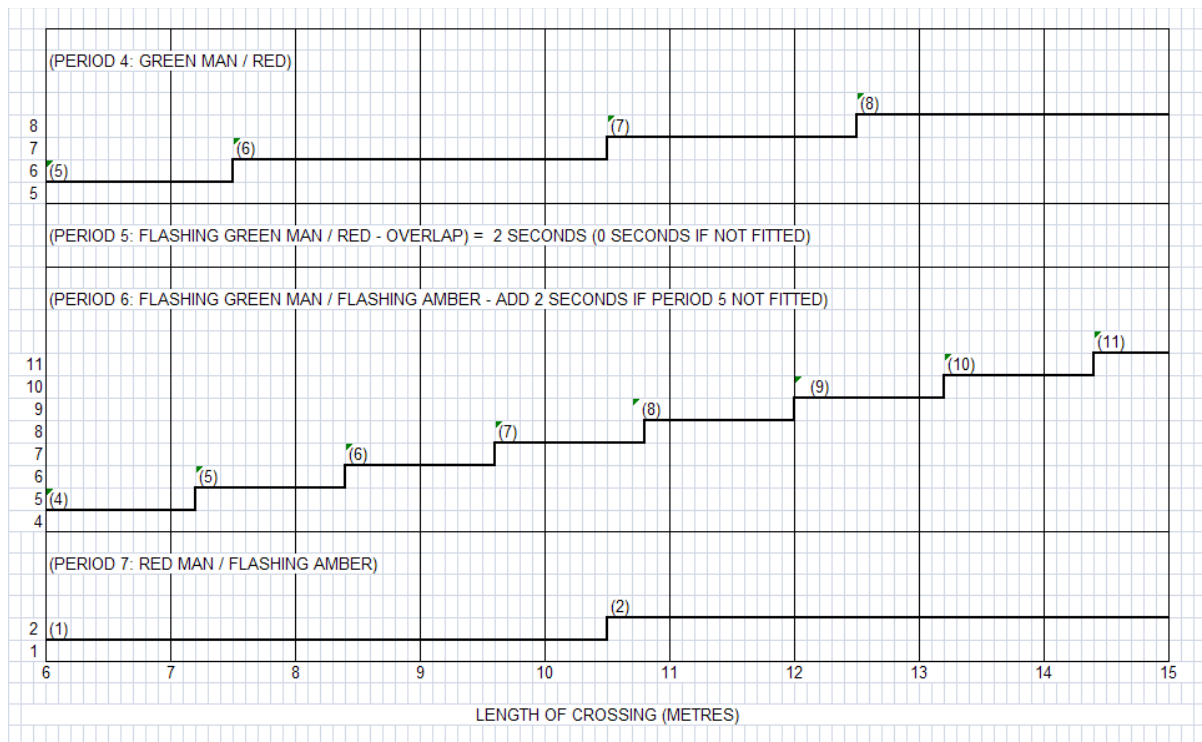


Figure 9

4.2 Ped X Crossing Timings

4.2.1 Period Timings

Period 1	Red Man - Green	20 seconds (FVP) 20 seconds max, 7 seconds min (VA)
ALT Period 1 (where dual VP required) 7 - 20 seconds		
Period 2	Red Man - Amber	3 seconds - mandatory
Period 3	Red Man - Red	2 seconds - gap change 2 seconds - max change 2 second - fixed time 3 seconds - SDE change 2 second - computer change

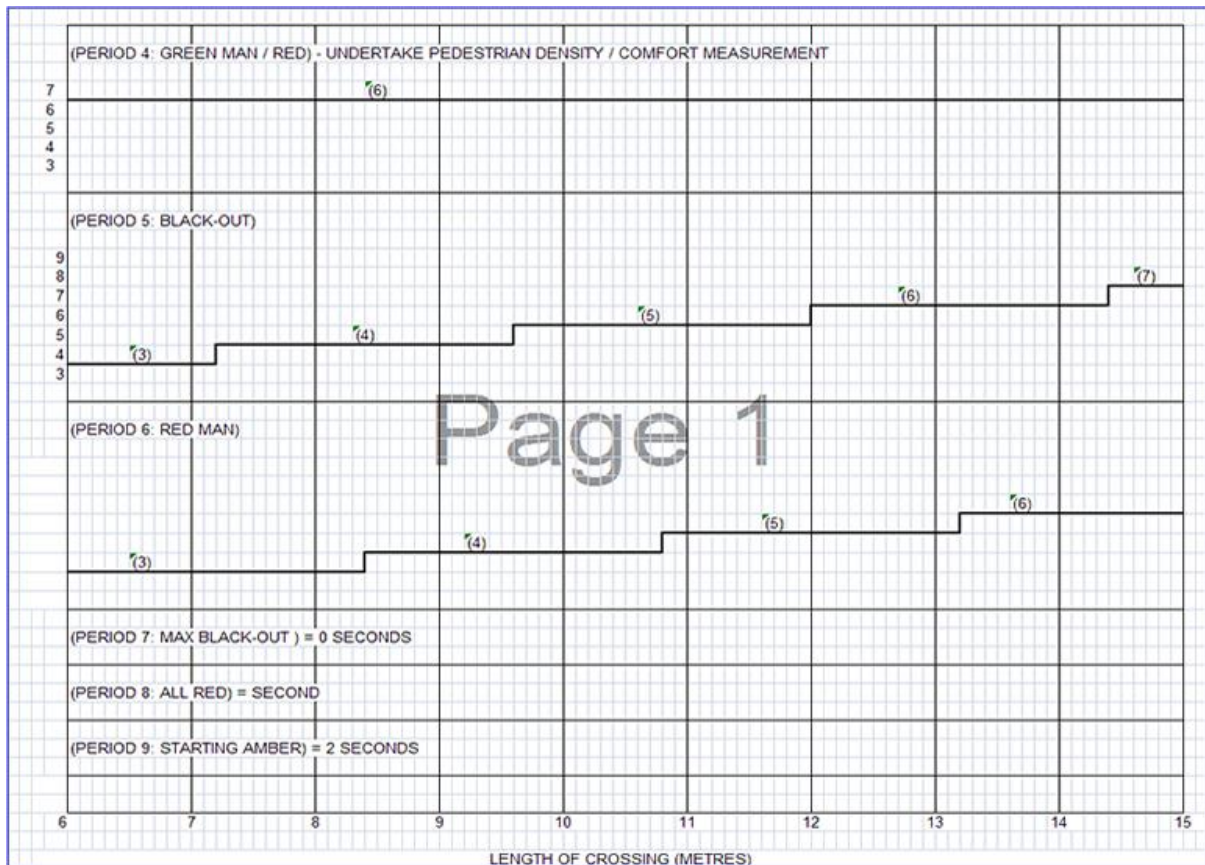


Figure 10

## 4.3 Far-sided Toucans and One Cans (Royal Parks only)

### 4.3.1 Period Timings

Period 1	Red Man - Green	20 seconds (FVP) 20 seconds max, 7 seconds min (VA)
ALT Period 1 (where dual VP required)		7 - 20 seconds
Period 2	Red Man - Amber	3 seconds - mandatory
Period 3	Red Man - Red	2 seconds - gap change 2 seconds - max change 2 second - fixed time 2 second - computer change 3 seconds - SDE change

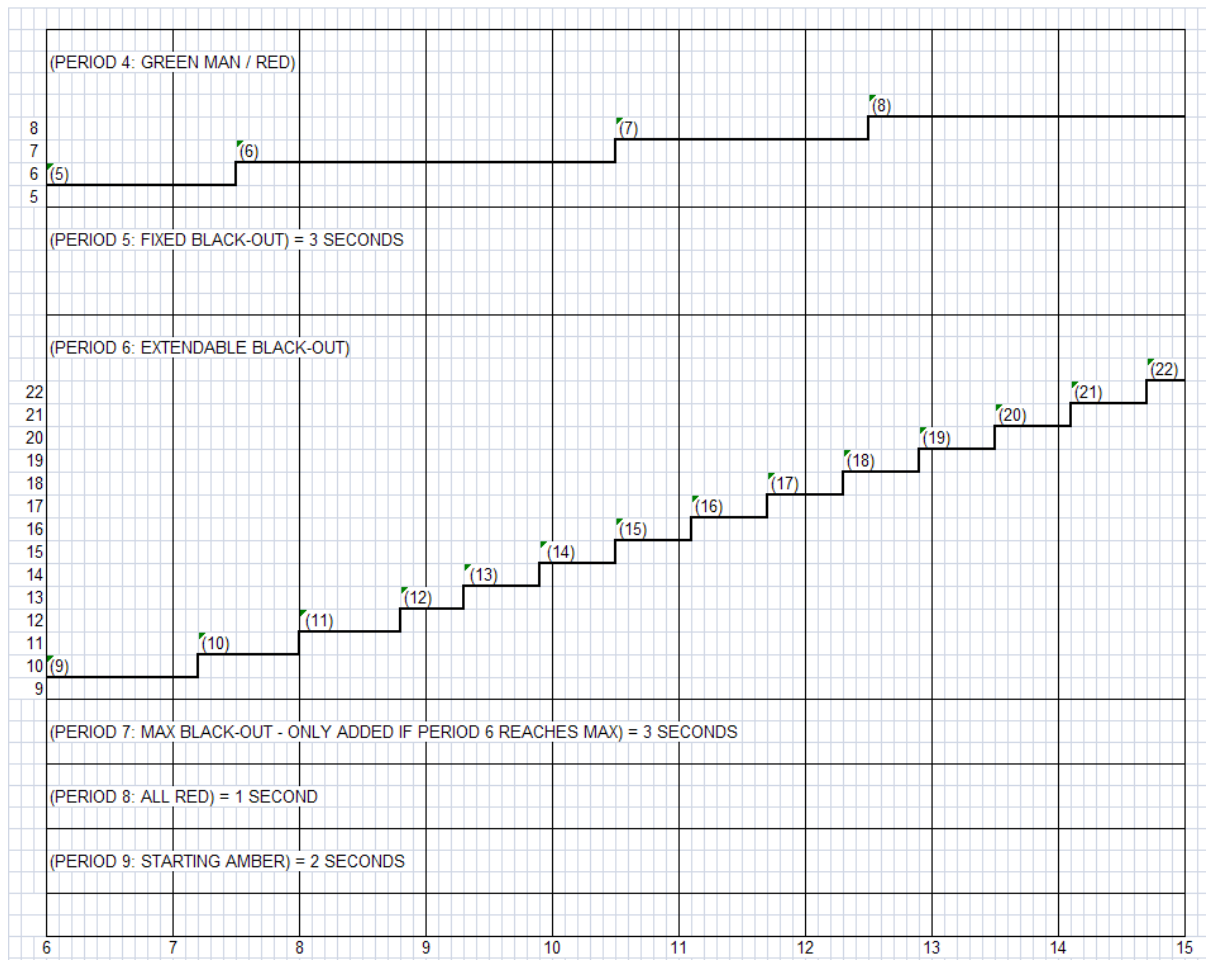


Figure 11

# Traffic Signal Timings

## 4.4 Near-sided Crossings (Puffins, Toucans and Equestrians)

### 4.4.1 Period Timings

Period 1	Red Man - Green	20 seconds (FVP)	
		20 seconds max, 7 seconds min (VA)	
ALT Period 1 (where dual VP required)		7 - 20 seconds	
Period 2	Red Man - Amber	3 seconds	- mandatory
Period 3	Red Man - Red	2 seconds	- gap change
		2 seconds	- max change
		2 second	- fixed time
		2 second	- computer change
		3 seconds	- SDE change

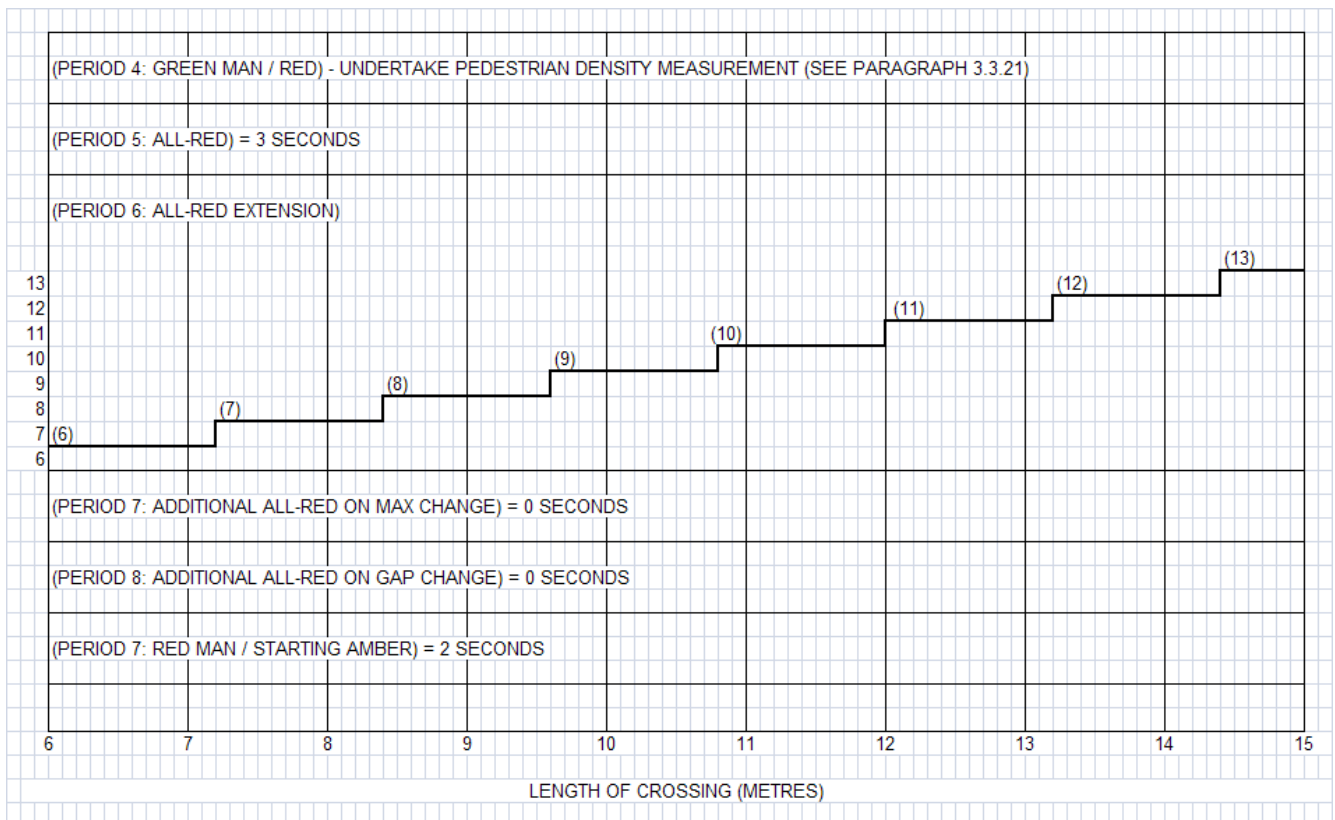


Figure 12

## **5 Relevant Documentation**

Department for Transport Advice Notes and Guidance Documents

- 5.1 LTN02/95 Design of Pedestrian Crossings
- 5.2 TAL05/05 Pedestrian Facilities at Signal Controlled Junctions Part 4
- 5.3 TAL01/06 General Principles of Traffic Control by Light Signals
- 5.4 Design Manual for Roads and Bridges (DMRB)
- 5.5 LTN1/98 The Installation of Traffic Signals and Associated Equipment
- 5.6 LTN2/95 The Design of Pedestrian Crossings
- 5.7 LTN2/08 Cycle Infrastructure Design
- 5.8 TAL1/06 General Principles of Traffic Control by Light Signals
- 5.9 TAL3/03 Equestrian Crossings
- 5.10 TD50/04 The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts
- 5.11 TAL5/05 Pedestrian Facilities at Signal controlled Junctions



## 6 Structure

The documents listed below form a set of guidance and procedures for the design of traffic signals and signal junctions in London:

- [SQA-0640](#) Policy, Standards and Guidance to Procedures for the Design of Traffic Signals
- [SQA-0641](#) High Level Process for the Design of Traffic Signals
- [SQA-0642](#) Client Requirements
- [SQA-0643](#) Design for Signalised Junctions
- [SQA-0644](#) Design for Stand Alone Crossings
- [SQA-0645](#) Traffic Signal Timings
- [SQA-0646](#) Safety Auditing of Signal Schemes
- [SQA-0647](#) Justification for Traffic Signals
- [SQA-0648](#) Documentation for the Design File
- [SQA-0651](#) Design of Traffic Signal Control for Pedal Cycles

## 7 Document Control

Issue	Date	Change Summary	Author	Checker	Approver
1	June 2013	Previously incorporated in SQA-0064. Issued for use.	K Van Tuyl	S Poole	A Scriven
2	Aug 13	Revised following consultation	K Van Tuyl	S Poole	A Scriven
3	Dec 13	Reference to TD amended to RSM, TI (Signals) to AMD	R Pierson (Quality Analyst - AMD)	J Fraser (Quality Manager - AMD)	A Scriven (Chief Engineer - TI Signals)