Disclaimer and conditions for use

This Specification has been prepared by Roads and Maritime Services (referred to herein as RMS) for use, insofar as it is applicable, in the State of New South Wales for equipment supplied under an RMS procurement order or contract, or under a procurement order or contract from another party that is required in writing by RMS to use this Specification.

The use of this RMS Specification other than by those parties stated above and in the manner stated above is not recommended by RMS. Any such use is entirely the decision of the user alone. RMS disclaims all responsibilities arising whether directly or indirectly from any such use. RMS does not warrant that this Specification is error free, nor does RMS warrant the suitability, fitness or otherwise of this Specification for any stated or implied purposes expressed or implied in this Specification or other documents. By using this Specification, the user agrees to indemnify RMS against the full amount of all expenses, losses, damages and costs (on a full indemnity basis and whether or not incurred by or awarded against RMS) which may be suffered by any person or RMS in connection with or arising out of the use of this Specification in any manner.

RMS is not under any duty to inform you of any errors in or changes to the Specification.
About this release

<table>
<thead>
<tr>
<th>Title:</th>
<th>Specification of Vehicle Group Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document number:</td>
<td>TS-TN-019</td>
</tr>
<tr>
<td>Version:</td>
<td>1.2</td>
</tr>
<tr>
<td>Prepared by:</td>
<td>Lyndall Johnson, Network Operations</td>
</tr>
<tr>
<td>Contributors:</td>
<td>James Grima, Andrew Walgers, Leanne Hyatt (Network Operations)</td>
</tr>
<tr>
<td>Endorsed by:</td>
<td>Neil Leitch, Principal Manager Network Operations</td>
</tr>
<tr>
<td>Approved by:</td>
<td>Neil Leitch, Principal Manager Network Operations</td>
</tr>
<tr>
<td>Date of approval and effect:</td>
<td>28 July 2017</td>
</tr>
<tr>
<td>Next review date:</td>
<td>July 2020</td>
</tr>
<tr>
<td>Keywords:</td>
<td>Traffic signals, vehicles</td>
</tr>
<tr>
<td>Email for enquiries or feedback:</td>
<td><a href="mailto:technical.directions.publication@rms.nsw.gov.au">technical.directions.publication@rms.nsw.gov.au</a></td>
</tr>
</tbody>
</table>

Document History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Reason for amendment</th>
<th>Approved by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>26 May 2009</td>
<td>Original Issue</td>
<td>P Margison, GM Traffic Management</td>
</tr>
<tr>
<td>1.2</td>
<td>28 Jul 2017</td>
<td>Correction to flowchart in section 6.15.</td>
<td>N Leitch, PM Network Operations</td>
</tr>
</tbody>
</table>
Contents

1. Introduction ....................................................................................................................................... 4
   1.1 Definitions and Abbreviations ........................................................................................... 4
   1.2 References ....................................................................................................................... 5
   1.3 Associated Documents ..................................................................................................... 5
2. Design Steps ..................................................................................................................................... 5
3. Vehicle Group Table Specification ..................................................................................................... 6
   3.1 Late Start Specification ..................................................................................................... 7
   3.2 Pedestrian Protection ....................................................................................................... 7
4. Vehicle Group Operation ................................................................................................................. 10
   4.1 Filter Phase .....................................................................................................................10
   4.2 Overlap ............................................................................................................................11
5. Standard Table Format .................................................................................................................... 11
   5.1 Structure ..........................................................................................................................11
   5.2 Definitions and Abbreviations ..........................................................................................12
   5.3 SCATS Signal Pulses ......................................................................................................12
6. Standard Table Selection Charts ..................................................................................................... 13
   6.1 Main Selection Chart .......................................................................................................13
   6.2 Left Turn Selection Chart – Sheet 1 .................................................................................14
   6.3 Left Turn Selection Chart – Sheet 1-1 ..............................................................................15
   6.4 Left Turn Selection Chart – Sheet 1-2 ..............................................................................15
   6.5 Left Turn Selection Chart – Sheet 1-2-1 ...........................................................................16
   6.6 Left Turn Selection Chart – Sheet 1-3 ..............................................................................17
   6.7 Left Turn Selection Chart – Sheet 1-3-1 ...........................................................................17
   6.8 Left Turn Selection Chart – Sheet 1-4 ..............................................................................18
   6.9 Left Turn Selection Chart – Sheet 1-5 ..............................................................................18
   6.10 Right Turn Selection Chart – Sheet 2 .............................................................................19
   6.11 Right Turn Selection Chart – Sheet 2-1 ..........................................................................20
   6.12 Right Turn Selection Chart – Sheet 2-2 ..........................................................................20
   6.13 Right Turn Selection Chart – Sheet 2-2-1 ......................................................................21
   6.14 Right Turn Selection Chart – Sheet 2-3 ..........................................................................21
   6.15 Main Signal Selection Chart – Sheet 3 .............................................................................22
   6.16 Main Signal Selection Chart – Sheet 3-1 ...........................................................................23
7. Standard Table Selection Guides .................................................................................................... 23
   7.1 Selection Guide for Main Signals .....................................................................................24
   7.2 Selection Guide for Right Turn Arrows .............................................................................24
   7.3 Left Turn Arrows ...............................................................................................................25

List of Figures

Figure 1 Illustration of transverse and parallel (direct and side) pedestrian conflict for a left turn........8
1. Introduction

This document provides a description of the method to be adopted in specifying the colour sequences for a vehicle group for all possible phase sequences and conditions applying to the group. It replaces the Standard for Signal Group Displays [4].

A table technique has been developed and is briefly described below.

In the first instance consideration is given to the intersection as a whole to determine the constraints placed on each vehicle group by other signal groups and movements at the intersection. The factors which must be considered are:

(a) Direct conflict of movements.
(b) Absence/presence of a conflicting filter movement.
(c) Whether a movement utilises a traffic lane which is shared with another movement, e.g. a lane may be shared by through traffic and left turn traffic.
(d) Absence/presence of a pedestrian conflict.
(e) The degree of protection required for pedestrian conflicts.

The colour sequences for each vehicle group are then specified for each set of considerations for the phases of the intersection. The selection guides, section 6, are simply flowcharts leading to a particular table given the answers to the factors (b) – (e) above.

To specify a vehicle group merely requires the answers to (b) – (e) to be provided on the design plan. The standard tables associated with this document specify the actual colour sequences for the vehicle groups. The technique handles all intersections by answers to the same questions. The tables are analogous to those presented in this document. A specific exception is the case of single and double diamond overlap designs, for which separate standards already exist, TS-TN-026 [14] and TS-TN-027 [15].

1.1 Definitions and Abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPD</td>
<td>Example Personality Data</td>
</tr>
<tr>
<td>GRN</td>
<td>Green</td>
</tr>
<tr>
<td>Intergreen</td>
<td>A term used to collectively refer to the following intervals: Early Cut Off, Yellow and All red. Also referred to as the “clearance” part of the running phase.</td>
</tr>
<tr>
<td>LM</td>
<td>Library Macro</td>
</tr>
<tr>
<td>LT</td>
<td>Left Turn</td>
</tr>
<tr>
<td>LTOR</td>
<td>Left Turn On Red</td>
</tr>
<tr>
<td>OD</td>
<td>Operational Description</td>
</tr>
<tr>
<td>Overlap</td>
<td>Where a vehicle group displays green during the intergreen</td>
</tr>
<tr>
<td>RA</td>
<td>Red Arrow</td>
</tr>
<tr>
<td>RT</td>
<td>Right Turn</td>
</tr>
<tr>
<td>RMS</td>
<td>Roads and Maritime Services</td>
</tr>
<tr>
<td>TAE</td>
<td>Typical Application Example</td>
</tr>
<tr>
<td>W&amp;CL</td>
<td>Walk and Clearance</td>
</tr>
</tbody>
</table>
1.2 References

[3] VD018-6, Standard for Double Diamond Overlap Design
[7] VD018-6, Standard for Double Diamond Overlap Design

1.3 Associated Documents


2. Design Steps

The complete process for developing an intersection design correctly is given in Traffic Signal Design, [7] and briefly outlined below.

1. Prepare a sketch of the intersection including lane markings, pedestrian crossings and detector locations. Make sure to distinguish between shared and exclusive lanes.
2. Prepare a sketch of the movements permitted in each phase (one sketch per phase) with arrows indicating the direction of movement.
3. Add the primary lanterns for each vehicle group to the sketch.
4. Add group labelling to the lanterns in accordance with Traffic Signal Design, [7].
5. Determine what vehicle groups are required.

All vehicle groups should be listed in a signal group/phase chart on the design plan. The chart should provide for each identified signal group:

- An indication of when it is green, or conditionally green, during each phase.
- The appropriate table type, as determined from the relevant flowcharts in section 6.
- Any particular remarks, eg the degree of pedestrian protection.

The operation of all pedestrian groups should also be described by entries in the table.

For example:
3. Vehicle Group Table Specification

The following table technique is used as a means of specifying all possible vehicle group colour changes/sequences in a manner suitable for direct translation into the colour tables in the controller personality.

The explanation of the technique is with reference to the table in the figure below.

<table>
<thead>
<tr>
<th>Signal Group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Table Type (from Selection Guide)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>V2</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>V3</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>41</td>
<td>Timed red arrow protection for P1 pedestrian; Z- filter option</td>
</tr>
<tr>
<td>V5</td>
<td>X</td>
<td>C</td>
<td></td>
<td></td>
<td>14</td>
<td>Timed red arrow protection for P3 pedestrian</td>
</tr>
<tr>
<td>P2</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

The example above specifies the colour sequences for a vehicle group at a 3 phase intersection during ‘A’ phase.

Column ① specifies the running phase under consideration, that is, the phase which the controller is considered to be ‘IN’. Thus INA, INB or INC in this first column specifies the running phase to be A, B or C respectively.

Column ② specifies the colour for the vehicle group for the LATE START to EXTENSION (REST) intervals for the running phase specified in column 1. In the example, the colour specified is RED. It should be noted that the vehicle group colour may change in the LATE START to EXTENSION intervals, as for example would be the case for a red arrow protecting a pedestrian WALK. In such a case the conditions and the colours are specified in column 2 to fully describe the colour changes in the LATE START to EXTENSION intervals. There are 2 types of situation where the colour may change during the LATE START to EXTENSION intervals. The first is where the display of the “normal” phase colour is delayed until the LATE START interval has finished, section 3.1 below provides further information. The second situation follows where a pedestrian demand in the phase causes a RED to be displayed to protect a pedestrian movement; section 3.2 below provides further information.

Column ③ specifies the phase to follow the running phase, (i.e. the phase in column 1). Clearly there must be entries in this column for all other phases to allow the vehicle group colour changes to be fully specified. The technique provides a set of rows, one for each phase which may follow the running phase. Note that the controller cannot leave the EXTENSION (REST) interval on the running phase until the next phase to follow has been determined, and that once the next phase has been established it cannot be changed. Thus the boundary between columns 2 and 3 is a decision point regarding which phase is to follow.

The remaining columns (④ and ⑤) specify the colour sequences for the vehicle group in the intergreen part of the running phase, that is, the EARLY CUT OFF GREEN to ALL RED intervals. A colour must be specified for each of these intervals for the particular phase change to fully specify the colour sequence for the vehicle group. Thus colours must be specified for the intervals ECO GREEN, YELLOW and ALL RED. A convention has been adopted to avoid redundant repetition in specifying the colours for these intervals, as follows:
(a) If no ECO GREEN interval applies, then no colour is specified. Further, it is implicitly assumed that the colour for the ECO GREEN interval is the same as for the EXTENSION (REST) interval in the event that a non-zero time is specified unless specifically noted to the contrary. For most cases no colour would need to be specified.

(b) If the same colour applies for the YELLOW and ALL RED intervals, then a single colour only is specified which is interpreted as applying to both intervals.

Further to the colours for the ECO GREEN to ALL RED intervals, the colour at the commencement of the new phase is also specified.

Considering the first row in the example, it is seen that vehicle group colour is RED in A phase, and remains RED in the ECO GREEN to ALL RED intervals when ‘B’ phase is the next phase, and then becomes GREEN at the commencement of ‘B’ phase.

There may be other conditions affecting the colour sequence for a particular change in phase, such as whether a pedestrian movement will be introduced in the following phase. The extra conditions are catered for by providing an additional column (or columns) in the table, and adding as many rows as necessary to cover all combinations of conditions. The example illustrates this for the transition from A phase to C phase. It is seen that the vehicle group remains RED in the ECO GREEN to ALL RED intervals in each case, however the vehicle display becomes OFF in ‘C’ phase when the ‘C’ pedestrian was not called, and remains RED for WALK and CLEARANCE in ‘C’ phase when the ‘C’ pedestrian was called.

### 3.1 Late Start Specification

The late start protection is generally provided to allow late/slow moving vehicles to clear the path of the vehicles being held by the delay in displaying the “normal” phase colour.

<table>
<thead>
<tr>
<th>INB</th>
<th>TOA</th>
<th>TOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONDITIONAL RED IN LATE START GREEN</td>
<td>GREEN, GREEN IN A</td>
<td>YELLOW, RED, RED IN C</td>
</tr>
</tbody>
</table>

This colour change at the end of LATE START does not cause any differences to the subsequent colour sequences from the running phase to the next phase.

### 3.2 Pedestrian Protection

When a vehicle movement conflicts with a pedestrian movement, it may be necessary to provide protection for the pedestrians by displaying a red aspect arrow or roundel. The degree of protection depends on the conflict. There are five levels of protection:

- **No protection.**
- **Protection timed during the walk interval.** This is the default treatment for all marked foot crossings. For roundels, a minimum of four seconds should be provided to permit pedestrians to establish their movement before the parallel traffic movement begins.
- **Protection for the walk interval (not generally used on its own).**
- **Protection timed during the walk and clearance intervals, though protection is provided for the whole of the walk interval as a minimum.**
- **Full protection for the whole of the walk and clearance intervals.**

In the cases for timed protection a time setting is required/ provided. Care is required when allocating a time setting to allow for regular use by slow/ incapacitated pedestrians.

The format and interpretation of the specification table for a vehicle group protecting a pedestrian movement is given in sections 3.2.2 and 3.2.3 below.

At certain intersections and for particular cases the removal of the red aspect may not mean a green aspect is given. Rather the red aspect is replaced by an off display to allow vehicles to filter subject to the driver taking care for pedestrians still using the crossing.
Full pedestrian protection is required under many situations and these are given in Traffic Signal Design, [7].

There are two types of pedestrian movement which may conflict with the vehicle movement; these are referred to in the standard tables as transverse and parallel, but are also known as direct and side conflicting pedestrian movements. Where no distinction is made as to the type of conflicting pedestrian movement the conflicting movement is a parallel (side) pedestrian movement. Figure 1 below illustrates the situation:

![Figure 1 Illustration of transverse and parallel (direct and side) pedestrian conflict for a left turn](image)

The specification of the pedestrian protection may come in two parts the first is the specification schedule and the second part may be the addition of a time setting.

### 3.2.1 Pedestrian Overlap

A pedestrian movement may overlap from one phase to the next. This determination is dependent on the following aspects.

- Whether the pedestrian movement is permitted in both phases.

Depending on the above aspects the controller may allow a phase to terminate while a pedestrian movement is still running. The vehicle group will continue to protect the pedestrian movement in the way specified in the vehicle group table.

### 3.2.2 Full Protection

The vehicle group specification table for where full protection is provided will be similar to the following.

<table>
<thead>
<tr>
<th></th>
<th>CONDITIONAL RED FOR W&amp;CL</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOB</td>
<td>RED FOR W&amp;CL, GREEN AT END W&amp;CL, GREEN IN B</td>
<td></td>
</tr>
<tr>
<td>TOC</td>
<td>RED, GREEN IN C</td>
<td></td>
</tr>
<tr>
<td>TOD</td>
<td>RED, RED IN D</td>
<td></td>
</tr>
<tr>
<td>TOB</td>
<td>GREEN, GREEN IN B</td>
<td></td>
</tr>
<tr>
<td>TOC</td>
<td>OFF, GREEN IN C</td>
<td></td>
</tr>
<tr>
<td>TOD</td>
<td>OFF, RED, RED IN D</td>
<td></td>
</tr>
</tbody>
</table>

It is not always possible to know the length of time a pedestrian movement is protected compared to the length of the phase. In certain situations it is possible for the pedestrian movement to overlap to the next phase while the first phase is terminated. In the case where the pedestrian movement cannot overlap to the next phase, the pedestrian movement must
complete before the phase can end, ie all the pedestrian movement intervals (walk 1, walk 2, clearance 1 and clearance 2) must have completed. In addition, the clearance 1 interval must have completed before the phase termination point (ie the start of ECG).

There are two ways in which the vehicle group can transition to the next phase. They are given in the right side of the upper and lower halves of the INA table above. To better explain the way in which the vehicle group operates the following explanation is provided.

The lower half transitions are used when:

- The pedestrian movement is not demanded. In the LATE START to EXTENSION intervals the lower half of INA is active. In this case the vehicle group is OFF and the transitions to the next phase are as given in the lower half of INA.
- The pedestrian movement is demanded and completes prior to the phase termination point, phase minimum is not being timed, the operation within A phase reverts to the lower half of INA, in this case the vehicle group goes OFF and the transitions to the next phase are as given in the lower half of INA.
- The pedestrian movement is demanded and completes prior to the phase termination point and prior to the point at which phase minimum starts being timed, the operation within A phase reverts to the lower half of INA, in this case the vehicle group goes OFF and the transition to the next phase are as given in the lower half of INA.

The upper half transitions are used when the pedestrian movement is demanded and:

- In the case where the pedestrian movement can overlap the pedestrian movement may continue through the "clearance" part of the running phase and into the next phase. Once the pedestrian demand has been satisfied the colour in the next phase will be that given in the appropriate IN_ for the next phase.
- The pedestrian movement completes prior to the phase termination point, but due to minimum times for giving a display the vehicle group is held RED during the remainder of the phase running intervals. The displayed colour may change during the intergreen intervals if the colour during the intergreen is the same as that which will be displayed during the next phase. Compare the TOB and TOC boxes in the upper and lower halves of INA above.; or
- The pedestrian movement completes after the phase termination point, the operation within A phase remains with the upper half of INA. In this case the vehicle group remains RED until the end of W&CL and the transitions to the next phase are as given in the upper half of INA. The displayed colour may change during the intergreen intervals if the colour during the intergreen is the same as that which will be displayed during the next phase. Compare the TOB and TOC boxes in the upper half of INA above.

3.2.3 Other Types of Protection

A number of pedestrian movements are not protected for the complete walk and clearance intervals, but are protected for WALK or dependent on the length of a timer. In this instance the vehicle group table specification will read similar to the following examples.

Pedestrian protection given for Walk:

<table>
<thead>
<tr>
<th>INB</th>
<th>CONDITIONAL RED FOR WALK GREEN</th>
<th>TOA</th>
<th>GREEN, GREEN IN A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOC YELLOW, RED, RED IN C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pedestrian protection timed during Walk (in this example the vehicle group is a roundel):

<table>
<thead>
<tr>
<th>INC</th>
<th>CONDITIONAL RED FOR TIMER GREEN</th>
<th>TOA</th>
<th>GREEN, GREEN IN A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOB YELLOW, RED, RED IN B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pedestrian protection given for Walk and timed during Clearance:

<table>
<thead>
<tr>
<th></th>
<th>CONDITIONAL RED FOR WALK OR ARROW TIME</th>
<th>TOB</th>
<th>RED FOR ARROW TIME, GREEN, GREEN IN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA</td>
<td></td>
<td>TOC</td>
<td>RED FOR ARROW TIME, RED, RED IN C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB</td>
<td>GREEN, GREEN IN B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOC</td>
<td>OFF, RED, RED IN C</td>
</tr>
</tbody>
</table>

In the first and second examples, it is considered that the pedestrian protection will have completed before the running phase terminates, and thus the vehicle group will have reverted to its ‘normal’ colour prior to the phase termination point.

In the third example above, it is considered that the pedestrian protection completion may not be so simply stated and the transitions of the vehicle group will vary in a similar way as to that given above in section 3.2.2 for full protection.

There is a final issue with regard to the protection given a pedestrian movement and that is that after a red aspect is provided it may be replaced with an OFF display for any remaining time of the Walk and Clearance intervals before reverting to its ‘normal’ colour. This is illustrated in the following two examples.

<table>
<thead>
<tr>
<th></th>
<th>CONDITIONAL RED FOR ARROW TIME OFF FOR THE REMAINDER OF W&amp;CL</th>
<th>TOA</th>
<th>OFF, GREEN IN A</th>
</tr>
</thead>
<tbody>
<tr>
<td>INB</td>
<td></td>
<td>TOC</td>
<td>OFF, RED, RED IN C</td>
</tr>
</tbody>
</table>

Or

<table>
<thead>
<tr>
<th></th>
<th>CONDITIONAL RED FOR ARROW TIME OFF FOR THE REMAINDER OF W&amp;CL</th>
<th>TOB</th>
<th>OFF FOR W&amp;CL, GREEN AT END W&amp;CL, GREEN IN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>INA</td>
<td></td>
<td>TOC</td>
<td>OFF, RED, RED IN C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB</td>
<td>GREEN, GREEN IN B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOC</td>
<td>YELLOW, RED, RED IN C</td>
</tr>
</tbody>
</table>

The first format is used where the ‘normal’ colour is OFF, ie the same as the colour shown during the remainder of walk and clearance. The second format is used where the ‘normal’ colour is GREEN to allow for differences in the way the vehicle group may transition to the next phase.

4. Vehicle Group Operation

Within the standard tables there a number of statements which may require a little explanation as to the complete meaning. These explanations are given below.

4.1 Filter Phase

A filter phase is one where the vehicle driver is required to obey the NSW Road Rules [9] before deciding to proceed. The driver will see a green roundel and either: three unlit arrows; or no arrows at all.

There are two types of filter movement:

- Left turn filter movements – drivers needs to be watchful for pedestrians crossing the road into which they are turning and vehicles which may be turning right into the same road from the opposite direction.
• Right turn filter movements – drivers needs to be watchful for pedestrians crossing the road into which they are turning; and oncoming vehicles going straight through and those which may be turning left into the same road, both have right of way.

4.2 Overlap

The phasing for an intersection can be set up or operate such that a vehicle group can display GREEN in consecutive phases. When this occurs it may be advantageous and more efficient for the vehicle group to maintain, or overlap, the GREEN during the intergreen intervals of the phase, ie early cut off green, yellow, all red. In addition, there are certain phase movement combinations where the vehicle group may display an overlap GREEN even though the vehicle group is OFF in either the preceding or succeeding phase. This is simply presented below.

<table>
<thead>
<tr>
<th>Current Phase</th>
<th>Next Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running intervals</td>
<td>Intergreen intervals</td>
</tr>
<tr>
<td>GREEN</td>
<td>GREEN</td>
</tr>
<tr>
<td>OFF</td>
<td>GREEN</td>
</tr>
<tr>
<td>GREEN</td>
<td>GREEN</td>
</tr>
</tbody>
</table>

There are certain situations where the overlap must not be allowed to occur even though the vehicle group may be GREEN in consecutive phases. Some common examples of why an overlap may not be allowed:

• There is an opposing right turn filter movement which needs to be given time to clear the intersection.

• A pedestrian movement is to be introduced at the start of the next phase.

• The lane is a shared lane and one of the movements is not allowed in the next phase.

5. Standard Table Format

The following sub-sections describe conventions within the standard tables which might not be self evident to the inexperienced reader.

5.1 Structure

Each table has five sections:

• Operational Description – provides a brief, human readable, layperson description of how the table operates. This will allow intersection designers to confirm that they have made the correct choice in table request for the Personality development.

• Typical Application Example – provides a layperson generic situation, in diagrammatic form, where it might be used and the specification that would reflect the example.

• Example Personality Data – provides the code that would be generated, with specific situation values for a specific situation. Explanation of the terms used in this section can be found in the Standard Personality Reference Manual, [16]. Note: the code given may not match the generic situation given in the Typical Application Example.

• Library Macro – provides the code which is used to generate the standard table code based on the answers given by the user to the questions asked by RGEN. Explanation of the terms used in this section can be found in guidelines for Layout of Macros for Standard Tables, [13].

• Revision History – provides a history of the changes to the table, including a brief summary of changes made before the tables were under formal change control procedures. OD, TAE, EPD and LM refer to the sections (identified above) of the table changed/affected.
Changes to the standard Pedestrian tables are controlled using the Standard Operating Procedure for Personality Standard Tables Management, [6]. The operational description, typical application example and example personality data can be extracted and used to form the notes file used in RGEN to aid the Personality developers. The Library Macro can be extracted to form the macro used in RGEN.

5.2 Definitions and Abbreviations

The following definitions and abbreviations are used within the layperson sections of the standard tables:

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG</td>
<td>Early Cut-off Green – refers to the early cut-off green interval of the phase. The ECG is the first of the three intergreen (or phase clearance) intervals.</td>
</tr>
<tr>
<td>ECO</td>
<td>Early Cut Off – a process where vehicle groups can be terminated at the start of ECG, rather than the end of ECG.</td>
</tr>
<tr>
<td>EPD</td>
<td>Example Personality Data</td>
</tr>
<tr>
<td>LM</td>
<td>Library Macro</td>
</tr>
<tr>
<td>LTOR</td>
<td>Left Turn On Red</td>
</tr>
<tr>
<td>OD</td>
<td>Operational Description</td>
</tr>
<tr>
<td>TAE</td>
<td>Typical Application Example</td>
</tr>
<tr>
<td>(n)</td>
<td>Implies the approach marked by n in the phase diagrams.</td>
</tr>
<tr>
<td></td>
<td>Used to signify a one aspect lantern</td>
</tr>
<tr>
<td></td>
<td>Used to signify a two aspect lantern</td>
</tr>
<tr>
<td></td>
<td>Used to signify a three aspect lantern</td>
</tr>
<tr>
<td></td>
<td>Used to signify a one aspect left or right turn lantern</td>
</tr>
<tr>
<td></td>
<td>Used to signify a single aspect left or right turn arrow in a four aspect lantern.</td>
</tr>
<tr>
<td></td>
<td>Used to signify a two aspect left or right turn lantern</td>
</tr>
<tr>
<td></td>
<td>Used to signify a three aspect left or right turn lantern</td>
</tr>
</tbody>
</table>

5.3 SCATS Signal Pulses

The Personality can be structured as to provide different modes of operation dependent on the presence, or not, of a signal from SCATS. In the vehicle group standard tables use is made of the Z-(ZNEG) and Z+ (ZPOS) signals.

Generally, the presence of the:
- Z- signal is used to allow filtering at intersections where it can be useful to stop filtering at certain times of the day, and
- Z+ is used to include a repeat phase in the operation of the intersection.
6. **Standard Table Selection Charts**

Those tables which are shaded do not currently exist, but have been identified for completeness.

### 6.1 Main Selection Chart

![Flowchart](image-url)

1. **Is the Signal Group for a left turn in a SDO or DDO?**
   - **Y**: See TN-TS-026 and TS-TN-027 respectively
   - **N**

2. **Is the Signal Group for a Left Turn??**
   - **Y**: 1
   - **N**

3. **Is the Signal Group for a Right Turn??**
   - **Y**: 2
   - **N**
6.2 Left Turn Selection Chart – Sheet 1

1

Is the Signal Group for a single aspect RED arrow?

Y

1-1

N

Is the Signal Group for an exclusive lane opposite a right turn with filter option?

Y

1-2

N

Is the Signal Group for an exclusive lane or opposite a right turn with filter option?

Y

1-3

N

Does the Signal Group protect a slipplane pedestrian movement?

Y

1-4

N

Does the Signal Group protect a direct conflict pedestrian movement?

Y

1-5

N

Does the Signal Group protect a side conflict pedestrian movement?

Y

1-6

N

Is the Signal Group 2 aspect?

Y

Table 11

N

Table 10

Y

Table 50

Note: Printed copies of this document are uncontrolled
6.3 Left Turn Selection Chart – Sheet 1-1

Does the pedestrian have full protection?

- Y
  - Is the protection timed for clearance?
    - Y
      - Table 30
    - N
      - Table 44
  - N
    - Table 71

6.4 Left Turn Selection Chart – Sheet 1-2

Does the Signal Group protect a direct conflict pedestrian movement?

- N
  - 1-2-1
  - Y
    - Does the Signal Group protect a side conflict pedestrian movement?
      - N
        - Is the pedestrian protection timed?
          - Y
            - Table 93
          - N
            - No table
      - Y
        - Is the protection timed for clearance?
          - Y
            - Table 84
          - N
            - Table 86

Note: Printed copies of this document are uncontrolled
6.5 Left Turn Selection Chart – Sheet 1-2-1

Does the Signal Group protect a side conflict pedestrian movement?

- No table
- No table

Is the pedestrian protection timed?

- Table 87
- Table 89

Is the protection timed for clearance?

- No table

Note: Printed copies of this document are uncontrolled
6.6 Left Turn Selection Chart – Sheet 1-3

Does the Signal Group protect a direct conflict pedestrian movement?

Yes → Y 1-3

No →

Does the Signal Group protect a side conflict pedestrian movement?

Yes →

Is the pedestrian protection timed?

Yes

Is the protection timed for clearance?

Yes →

No

Is the Adjacent Roundel delayed?

Yes →

No →

Table 91

Table 16

Table 9

Table 22

Table 13

Table 21

Table 12

Table 76

No

Table 17

Table 24

Table 23

Table 78

No

Y

N

Y

N

Y

N

Y

N

Does the Signal Group protect a side conflict pedestrian movement?

No →

Is the pedestrian protection timed?

Yes →

Is the protection timed for clearance?

Yes →

No

Is the Adjacent Roundel delayed?

Yes →

No →

Table 91

Table 16

Table 9

Table 22

Table 13

Table 21

Table 12

Table 76

Table 17

Table 24

Table 23

Table 78

Note: Printed copies of this document are uncontrolled
6.8 Left Turn Selection Chart – Sheet 1-4

Does the Signal Group protect a direct conflict pedestrian movement?

- Yes: Is the pedestrian protection timed?
  - Yes: Is the protection timed for clearance?
    - Yes: Table 28
    - No: Table 27
  - No: Table 20

- No: Table 79

6.9 Left Turn Selection Chart – Sheet 1-5

Does the Signal Group have a red phase?

- Yes: Is the pedestrian protection timed?
  - Yes: Is the protection timed for clearance?
    - Yes: Table 45
    - No: Table 46
  - No: Table 47

- No: Does the Signal Group have an unconditional green phase?
  - Yes: Is the pedestrian protection timed?
    - Yes: Is the protection timed for clearance?
      - Yes: Table 15
      - No: Table 14
    - No: Table 25
  - No: Table 77

Note: Printed copies of this document are uncontrolled.
6.10 Right Turn Selection Chart – Sheet 2

Is the Signal Group for a single aspect RED arrow?  
N  
Y  
2-1

Is the Signal Group Green for more than one phase?  
N  
Y  
2-2

Is the Signal Group Adjacent to a one-way overlap?  
N  
Y  
2-3

Does the Signal Group protect a conflicting pedestrian movement?  
N  
Y

Does the Signal Group have a filter?  
N  
Y

Is the pedestrian protection timed?  
N  
Y

Is the protection timed for clearance?  
N  
Y

Is the filter optional?  
N  
Y

Table 2  Table 5  Table 8  Table 7  Table 42  Table 6  Table 41  Table 75  Table 82
6.11 Right Turn Selection Chart – Sheet 2-1

Is the pedestrian protection timed?

Y

Is the protection timed for clearance?

N

Table 71

N

Table 29

Y

Table 83

6.12 Right Turn Selection Chart – Sheet 2-2

Is the Signal Group Adjacent to a one-way overlap?

Y

2-2-1

Is the Signal Group protect a conflicting pedestrian movement?

N

Does the Signal Group have a filter?

Y

Is the pedestrian protection timed?

N

Is the filter optional?

Y

Table 34

N

Table 35

Y

Table 38

N

Table 37

Y

Table 36

N

Table 40

Y

Table 39

N

Table 80

Y

Table 81
6.13 Right Turn Selection Chart – Sheet 2-2-1

Does the Signal Group protect a conflicting pedestrian movement?

N  Y

Is the pedestrian protection timed?

N  Y

Is the filter optional?

N  Y

Table 65  Table 68  Table 67  Table 70  Table 66  Table 69  Table 63  Table 64

6.14 Right Turn Selection Chart – Sheet 2-3

Does the Signal Group protect a conflicting pedestrian movement?

N  Y

Is the pedestrian protection timed?

N  Y

Is the filter optional?

N  Y

Table 55  Table 58  Table 57  Table 62  Table 56  Table 61  Table 59  Table 60
6.15 Main Signal Selection Chart – Sheet 3

- Is the signal group for more than one phase? 
  - Y → 3-1
  - N

- Does the signal group protect a conflicting pedestrian movement? 
  - Y
  - N
  - Table 52

- Does the signal group have a late start? 
  - Y
  - N
  - Table 51

- Does the signal group have an early cut-off? 
  - Y
  - N
  - Table 1

- Is the pedestrian protection timed? 
  - Y
  - N
  - Table 72

- Is the protection timed for clearance? 
  - Y
  - N
  - Table 74

- Is the protection for two pedestrians? 
  - Y
  - N
  - Table 94
### 6.16 Main Signal Selection Chart – Sheet 3-1

![Signal Selection Chart](chart.png)

### 7. Standard Table Selection Guides

Each table of the Vehicle Group Standards is covered separately, illustrating the default entries in the Signal Group Colour Table and the associated Signal group Condition Table. Entries in the Signal Group Minimum Table and the Signal Group Special Movement Table are also shown where these are required.

Flag 0 is reserved for including or skipping the LATE START interval in each phase.
7.1 Selection Guide for Main Signals

7.1.1 Single Phase
Full roundel which is green in one phase only

- Standard: Table 1
- Early Cut off: Table 51
- Late Start: Table 52
- Pedestrian protection timed during walk (1 ped): Table 73
- Pedestrian protection timed during walk (2 peds): Table 94
- Pedestrian protection timed during walk and part clearance: Table 74
- Pedestrian protection for walk & clearance: Table 72

7.1.2 Multiple Phases
Full roundel which is green in more than one phase

- Standard: Table 3
- One way overlap: Table 4
- Overlap conditional on opposite optional filter: Table 43
- Overlap conditional on conflicting pedestrian movement: Table 50
- Early Cut off: Table 53
- Late Start: Table 54

7.2 Selection Guide for Right Turn Arrows

7.2.1 Single Aspect
Pedestrian protection timed during walk: Table 29
Pedestrian protection timed during walk and part clearance: Table 83
Pedestrian protection for walk & clearance: Table 71

7.2.2 Standard Three Aspect

<table>
<thead>
<tr>
<th>Green in one phase only</th>
<th>No Pedestrian</th>
<th>Pedestrian Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>timed during walk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>timed during clearance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for walk &amp; clearance</td>
</tr>
<tr>
<td>No filter</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Filter</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Filter option</td>
<td>8</td>
<td>41</td>
</tr>
</tbody>
</table>

The following tables should be used where the adjacent major vehicle group provides a one-way overlap, ie tables 4 or 43.

<table>
<thead>
<tr>
<th>Green in one phase only</th>
<th>No Pedestrian</th>
<th>Pedestrian Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>timed during walk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>timed during clearance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for walk &amp; clearance</td>
</tr>
<tr>
<td>Filter</td>
<td>55</td>
<td>56</td>
</tr>
<tr>
<td>Filter option</td>
<td>58</td>
<td>61</td>
</tr>
</tbody>
</table>
The following tables should be used where the adjacent major vehicle group provides a one-way overlap, i.e., tables 4 or 43.

### 7.3 Left Turn Arrows

#### 7.3.1 Single Aspect

- Pedestrian protection timed during walk: Table 30
- Pedestrian protection timed during walk and part clearance: Table 44
- Pedestrian protection for walk & clearance: Table 71

#### 7.3.2 No Direct Conflicting Pedestrian Movement

<table>
<thead>
<tr>
<th>Green in more than one phase</th>
<th>No Pedestrian</th>
<th>Pedestrian Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>timed during walk</td>
<td>timed during clearance</td>
</tr>
<tr>
<td>Filter</td>
<td>65</td>
<td>66</td>
</tr>
<tr>
<td>Filter option</td>
<td>68</td>
<td>69</td>
</tr>
</tbody>
</table>

Tables in parenthesis () should be used where it is necessary for the Vehicle Group to be dependant on the colour displayed by the adjacent roundel.

Table 50 may also be used for protecting a conflicting pedestrian movement on a slip lane.
### 7.3.3 Direct Conflicting Pedestrian Movement

<table>
<thead>
<tr>
<th>No Parallel Pedestrian</th>
<th>Side Pedestrian Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>timed during walk</td>
</tr>
<tr>
<td>Shared lane or opposite right turn filter</td>
<td>17</td>
</tr>
<tr>
<td>Exclusive lane, opposite right turn filter - optional</td>
<td>-</td>
</tr>
<tr>
<td>Exclusive lane, no opposite right turn filter</td>
<td>20</td>
</tr>
</tbody>
</table>