Pedestrian Countdown at Traffic Signals

An overview of London's successful trials

September 2011
Overview

• Introduction
• Developing PCaTS
• PCaTS Trials
• Results
• Conclusion
Introduction: The Need for PCaTS

Pedestrian Understanding of Traffic Signals:

- Green man not understood as *invitation to cross*
- Research indicates around two thirds of pedestrians do not understand the blackout period
- Green man invitation artificially high at some sites in an effort to mitigate the misunderstanding

Mayor’s Transport Strategy:

- Smoothing Traffic Flow:
  “… *Without prejudice to the safety of pedestrians or the needs of other vulnerable road users*”
Developing PCaTS

Research

- Review of international use of PCaTS
- Interviews used to develop potential PCaTS designs and canvass public opinion
- Engagement with DfT and HA to understand approvals process for trials and any further implementation

Functionality

- Countdown to red man: reduces pedestrian uncertainty and enables signal optimisation to support Mayor’s Transport Strategy
Discussions between DfT and TfL
Ruled out—Countdown with a still red man during the countdown
Ruled out—Countdown with a flashing green man during the countdown
Ruled out—3 aspect vertical solution with countdown numbers in the middle aspect
Ruled out—A graphic as opposed to a digital countdown
Ruled out—Animated walking green man during the invitation to cross period or any countdown period
Ruled out—Separate unit displaying countdown as opposed to joined to the existing two aspect unit
Decision—Countdown termination point will be the start of the still red man
Ref Doc
PCTS Sol Opt DfT Wkng 20090309_D
Minutes 9Mar09 - TfL PCTS - Solutions Workshop DTO DfT

Discussions between DfT and TfL
Ruled out—Red and green countdown numbers
Ruled out—Showing a green man with countdown numbers
Decision—Investigate 3 aspect solution to bolt on side and top/bottom of unit,
Decision—Investigate flashing amber man at same time as countdown
Include—Variation of countdown during the green man invitation to cross on all options
Ref Doc
Minutes 3Mar09 - TfL PCTS - Solutions Options Mtg DTO DfT

Research and TfL/DfT Discussions
16 options investigated through interviews and ranked in order of preference,
Ruled out—12 options include flashing red, amber or green man stage which interfere with current sequence specified in TS RG 2002
Ruled out—Countdown numbers at same time of rad or green man interfere with current sequence specified in TS RG 2002
Ruled out—Flashing red man interfere with TS RG 2002
Ruled out—Flashing amber man interfere with TS RG 2002
LShaped option shown popular with pedestrians from Research
Ref Doc
Minutes 5June09 - TfL PCTS - Feedback on Solutions Options Mtg DTO DfT
Minutes 1June09 - TfL PCTS - Decisions on Solutions to take forward DTO DfT

Research and TfL Internal Discussions
Ruled out options C & D due to proximity to Patura
Ruled out option B due to TfL desire for consistency of design with other traffic infrastructure
Included option E due to mounting possibilities
PCaTS Trials

Off Street Trials

- Conducted at TRL test track using mocked-up crossings with and without PCaTS

- Over 250 pedestrians, including groups of mobility impaired pedestrians involved

- Questionnaires used to establish pedestrians’ understanding and opinions of Traffic Signals, including PCaTS
PCaTS Trials – The On Street PCaTS Package

- The trial sites included the installation of a Countdown timer alongside changes to the signal timings at the junctions. This is referred to as the “PCaTS package of measures” and included:

  - Reduction in Green Man time to a standard 6 seconds (aligned to DfT guidance)
  - Increase in ‘Blackout’ time (with a countdown timer)
  - Reduction in ‘All Red’ time (to a standard 3 seconds, with a 2 second starting amber to traffic)
  - Increase in traffic green time (as a consequence of the above changes).
PCaTS Trials

On Street Trials

- Approval granted by DfT and HA to conduct on street trials
- TRL commissioned to conduct face to face interviews and video analysis to assess pedestrian perceptions and behaviours
- Sites selected to ensure broad representation of pedestrians included in the research
# PCaTS Trials

## Trial Sites

<table>
<thead>
<tr>
<th>Site number</th>
<th>Site Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08/028  A201 BLACKFRIARS ROAD - B300 THE CUT - B300 UNION STREET</td>
</tr>
<tr>
<td>2</td>
<td>10/008  A24 BALHAM HIGH ROAD - CHESTNUT GROVE - BALHAM STATION ROAD</td>
</tr>
<tr>
<td>3</td>
<td>03/029  FINSBURY SQUARE - FINSBURY PAVEMENT - CHISWELL STREET</td>
</tr>
<tr>
<td>4</td>
<td>08/003  A100 TOWER BRIDGE ROAD - A200 TOOLEY STREET</td>
</tr>
<tr>
<td>5</td>
<td>10/160  A306 ROEHAMPTON LANE - QUEEN MARYS HOSPITAL MAIN ACCESS</td>
</tr>
<tr>
<td>6</td>
<td>08/211  OLD KENT ROAD - SURREY SQUARE - PENRY STREET</td>
</tr>
<tr>
<td>7</td>
<td>02/045  A4200 KINGSWAY - A40 HIGH HOLBORN - A4200 SOUTHAMPTON ROW</td>
</tr>
<tr>
<td>8</td>
<td>01/212  OXFORD STREET - REGENT STREET - OXFORD CIRCUS</td>
</tr>
</tbody>
</table>
Results – Pedestrian Perceptions

• The clear majority of pedestrians liked countdown:
  
  – 83% of the main sample
Results – Pedestrian Perceptions

• The clear majority of pedestrians liked countdown:
  – 94% of the mobility impaired pedestrians
Results – Pedestrian Perceptions

• The clear majority of pedestrians liked countdown:
  
  – 79% of the young pedestrians liked the countdown numbers
Results – Pedestrian Perceptions

• Preference for PCaTS:
  – Mobility impaired pedestrians and children had the opportunity to compare crossing experience with and without PCaTS – most preferred PCaTS:
Results – Pedestrian Perceptions

• Feeling Rushed:
  
  – For the main sample the proportion of pedestrians feeling rushed when crossing fell from 39% to 23%:
Results – Pedestrian Perceptions

- Feeling Rushed:

  - Mobility impaired pedestrians and children were asked which crossing they felt least rushed – this was PCaTS crossings for both samples:
Results – Pedestrian Perceptions

• Sufficient time to cross:

  – With PCaTS the percentage of pedestrians feeling they had sufficient time to cross increased from 75% to 88% (despite reduction in invitation to cross):
Results – Pedestrian Perceptions

• Sufficient time to cross:

– A greater proportion of mobility impaired pedestrians felt they had sufficient time to cross with PCaTS (despite reduction in the invitation to cross):

![Bar chart showing percentage of participants for different options: The standard crossing, Neither, The crossing with Countdown, and Don't know.]
Results – Pedestrian Perceptions

• Perception of Safety:

  – Although pedestrians felt safe at both types of crossing, more felt safe at PCaTS crossings, increasing from 73 to 91%:
Results – Pedestrian Perceptions

• Perception of Safety:

  – A greater proportion of mobility impaired pedestrians and children reported feeling safe at a PCaTS crossing, compared to a standard crossing:
Results – Pedestrian Crossing Behaviour

• Crossing decisions
  – Generally more pedestrians started to cross at the start of the countdown than in the blackout.
  – Fewer pedestrians started to cross towards the end of the countdown than during the last seconds of the blackout.
  – At the point where priority returned to vehicles there was no change in the number of pedestrians remaining on the crossing in the after situation.
Results – Pedestrian Behaviour

• Walking Speeds:

  – Walking speeds increased with PCaTS at the three sites where other factors (age and gender of pedestrians) were not significant:
Results – Pedestrian Crossing Behaviour

• The majority of pedestrians crossed as soon as possible after arriving at the junction, in both the before and after situations:
  – 54% crossed within 5 seconds of arrival
  – 70% crossed within 15 seconds of arrival
  – Over 85% had crossed within 30 seconds of arrival
Results – Conflicts

Conflicts measured in 5 categories:
- Level 1: Precautionary - stopping to allow the other road user to pass
- Level 2: Controlled – minor deviation from initial route, or controlled braking
- Level 3: Near Miss – rapid deceleration, lane change or stopping
- Level 4: Very Near Miss – emergency braking or violent swerve
- Level 5: Collision – actual contact between road users (none observed during trial).
Results – Conflicts

Findings

- No level 5 conflicts (collisions) were observed during the trials
- No changes were observed in level 3&4 conflicts (they remained very low)
- Decrease in level 2 conflicts at highest pedestrian flow sites (Oxford St & Kingsway)
- Increase in level 1 (precautionary) conflicts on average across all sites
- Decrease in conflicts overall at Oxford Street
Results – Vehicle observations

• Traffic Benefits:

– A Linsig model highlights the theoretical capacity increase generated by the PCaTS package:

<table>
<thead>
<tr>
<th>Site</th>
<th>AM</th>
<th>IP</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/028</td>
<td>14.3%</td>
<td>18.8%</td>
<td>15.2%</td>
</tr>
<tr>
<td>10/008</td>
<td>5.2%</td>
<td>5.0%</td>
<td>4.6%</td>
</tr>
<tr>
<td>03/029</td>
<td>20.0%</td>
<td>23.3%</td>
<td>16.4%</td>
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<tr>
<td>08/003</td>
<td>6.1%</td>
<td>5.5%</td>
<td>6.4%</td>
</tr>
<tr>
<td>10/160</td>
<td>2.1%</td>
<td>2.5%</td>
<td>2.2%</td>
</tr>
<tr>
<td>08/211</td>
<td>3.8%</td>
<td>3.8%</td>
<td>3.8%</td>
</tr>
<tr>
<td>02/045</td>
<td>10.7%</td>
<td>11.1%</td>
<td>10.4%</td>
</tr>
<tr>
<td>01/212</td>
<td>4.6%</td>
<td>5.3%</td>
<td>4.9%</td>
</tr>
</tbody>
</table>
Results – Vehicle observations

• Traffic Benefits:

  – Turning counts were used to measure the actual capacity benefits created by PCaTS. Due to variations in traffic flows between the before and after situation, these changes do not directly correlate to the theoretical capacity increases:

<table>
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<tr>
<th>Site</th>
<th>AM</th>
<th>IP</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/028</td>
<td>25.9%</td>
<td>25.7%</td>
<td>25.0%</td>
</tr>
<tr>
<td>10/008</td>
<td>-9.8%</td>
<td>-5.5%</td>
<td>-1.4%</td>
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<td>08/003</td>
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<td>5.3%</td>
<td>12.4%</td>
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<tr>
<td>10/160</td>
<td>-3.3%</td>
<td>-10.2%</td>
<td>-20.7%</td>
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<tr>
<td>08/211</td>
<td>13.9%</td>
<td>0.1%</td>
<td>-4.7%</td>
</tr>
<tr>
<td>02/045</td>
<td>6.7%</td>
<td>18.0%</td>
<td>15.1%</td>
</tr>
<tr>
<td>01/212</td>
<td>1.6%</td>
<td>4.5%</td>
<td>-16.1%</td>
</tr>
</tbody>
</table>
Results – Vehicle observations

• Traffic Benefits:
  – Astrid delay data for 3 sites with an increase in turning counts in all three peaks demonstrates decrease in delay despite increase in vehicles. Effects of Tower Bridge opening explain the delay increase at 08/03 on the Friday:
Results – Vehicle observations

• Traffic Benefits:

  – Typically, vehicle delay saving of around 8% has been achieved by PCaTS, estimated on a conservative basis, disregarding high results at two sites:

<table>
<thead>
<tr>
<th>Site</th>
<th>Average Delay before</th>
<th>Average Delay after</th>
<th>% difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/028</td>
<td>43.86</td>
<td>39.52</td>
<td>-9.9%</td>
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<tr>
<td>10/008</td>
<td>44.09</td>
<td>40.21</td>
<td>-8.8%</td>
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<tr>
<td>08/003</td>
<td>288.86</td>
<td>263.22</td>
<td>-8.9%</td>
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<tr>
<td>10/160</td>
<td>48.12</td>
<td>25.02</td>
<td>-48.0%</td>
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<td>08/211</td>
<td>22.4</td>
<td>20.26</td>
<td>-9.6%</td>
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<td>128.1</td>
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<tr>
<td>01/212</td>
<td>72.9</td>
<td>67.18</td>
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</tr>
</tbody>
</table>
Conclusion

This trial has demonstrated that the PCaTS package can deliver benefits to both traffic and pedestrians:

– PCaTS has had a positive response from the public

– PCaTS has reduced pedestrian uncertainty and more informed crossing choices are being made

– With the “PCaTS package” there are significant benefits to traffic

– The “PCaTS package” has been introduced without negative impact to safety
Questions?