

# Cycle Movement Control at Signalised Junctions

WORKING DRAFT

Prepared by: .....  
Elaine Carroll  
Consultant

Checked by: .....  
Robert Kelly  
Principal Consultant

Approved by: .....  
Joe Seymour  
Regional Director

Cycle Movement Control at Signalised Junctions

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Ground Floor, Grand Canal House, Upper Grand Canal Street, Dublin 4, Republic of Ireland  
Telephone: +353 (0) 1 238 3100 Website: <http://www.aecom.com>

Job No 60312195

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## Executive Summary

### Left turning traffic conflict - Directional Cycle Signals

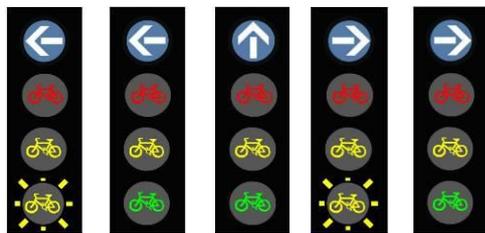
To allow different direction cycle streams to be controlled separately at signalised junctions.

#### Application/Implementation

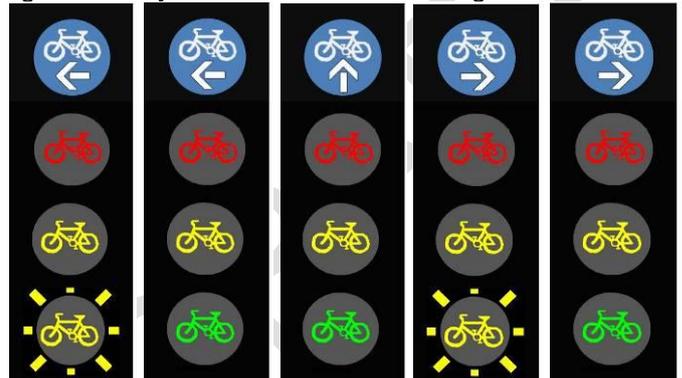
- To be implemented at a junction where there is a conflict between cyclists and vehicles.
- Separate approach lanes for each cycle movement direction to be provided where possible.

#### Amendments

- New cycle signals to be included in the Traffic Signs Manual.
- Appropriate legislation to be amended to include new signals and cyclist behaviour at these signals.



Low level mini signals (80mm-110mm)



Full "Toucan" size signals (200mm)

### Left turning traffic conflict - Left turning (Traffic) Yield to Cycles Sign & Signals

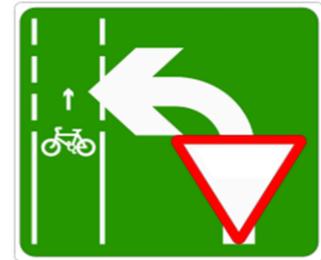
To warn turning motorists to yield to cyclists in the cycle lane to their left.

#### Application/Implementation

- To be placed before a junction where there is a conflict between cyclists proceeding straight ahead and left turning vehicles.
- To be implemented in conjunction with a flashing direction amber arrow and yield sign at the junction.

#### Amendments

- New sign to be included in the Traffic Signs Manual.
- Appropriate legislation to be amended if sign is considered a regulatory requirement.



Turning vehicles to yield to cyclists sign

### Right turning cyclist conflict - Box Turn or "Stay left to turn right"

To provide a safer right turning facility for cyclists at complicated junctions.

#### Application/Implementation

- To be placed at junctions where it is difficult for cyclists to turn right.
- To be implemented with a box turn waiting area road marking and primary signals for cyclists turning right.

#### Guidance/Legislation

- Road marking and signals to be added to Traffic Signs Manual.
- Appropriate legislation to be amended if road marking is considered a regulatory requirement.
- Guidance in National Cycle Manual to be updated to include signals.



Box turn waiting area road marking to the left of cycle lane



"Toucan" size (200mm) and low level mini (80mm-110mm) signals

## 1 Introduction

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# 1 Introduction

## 1.1 Purpose of report

AECOM has been commissioned by Dun Laoghaire Rathdown County Council and the National Transport Authority to undertake comprehensive research into how cycle movements are controlled at signalised junctions in other jurisdictions as part of safe bicycle friendly road infrastructure. This research has included the following:

- Review the traffic signs manual and cycle design manuals of various countries with an established history in cycle infrastructure and design;
- Identify existing cycle movement control systems from around Europe, that are applicable in Ireland, so tried and tested methods can be adopted;
- Check the safety record of the various configurations to establish if any safety issues have arisen;
- Provide a recommendation on the most appropriate solutions and how they would be applied on standard junction configurations (in terms of layout, staging and sequencing); and
- Provide set of criteria to compare alternative options to be trialled on street.

## 1.2 Peer Review

This draft research report has been reviewed by international cycle infrastructure expert André Pettinga, who is a director of Cyclemotions an independent consultancy specialising in urban cycling which is based in the Netherlands. André will also review the operation of the existing canal cycle signals during a site visit to Dublin and will comment on how they could be modified as part of this review of the regulations.

The draft research report will be reviewed and signed off by all stakeholders before drafting the regulations; this will ensure the regulations are based on national and international best practice.

## 1.3 Drafting Technical Note and Regulations

Following the sign off of this report AECOM will draft the statutory instrument for inclusion in an amendment to the Road Traffic (Signs) Regulations, including items not currently covered. The draft will include for the following items:

1. Cycle signals
2. Cycle directional signals
3. Left Turn (Traffic) Yield Signals/Sign
4. Box Turns

A technical note / explanation document will also be prepared for inclusion in the National Cycle Manual. This will be a summary of the recommendations proposed above and would be short and concise, similar to the Technical Advisor notes in the UK.

## 2 Background

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## 2 Background

### 2.1 Current Legislation

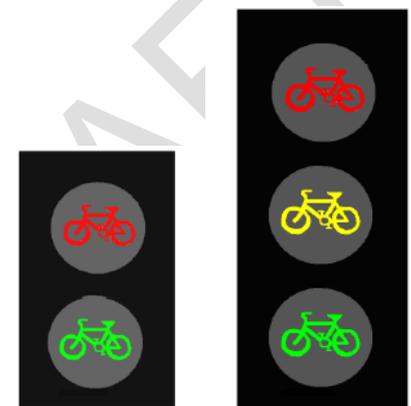
The current regulations for pedal cycle traffic signals are described in **Part IV Paragraph 36A of S.I. No. 331/2012 - Road Traffic (Signs) (Amendment) Regulations 2012**. These regulations describe the appearance, size and location of pedal cycle control signals, RTS 006 and RTS 007, and how they are to be operated.

These regulations state that a symbol of a pedal cycle in green/red or green/amber/red on a black background is to be used to indicate permitted crossing for a cyclist.

The signals can be full size, between 200mm and 215mm, or reduced size, between 80mm and 110mm.

The full size signals must be placed between 2.1m and 3.05m above the ground. The reduced size signals must be placed between 1.5m and 1.7m but not more than 3.05m above the ground. It should be noted that reduced sized signals are not recommended to be placed at a height above 1.7m according to international standards.

The regulations for pedal cyclists behaviour at these signals is described separately in **Part III Paragraph 47 of S.I. No. 332/2012 –Road Traffic (Traffic and Parking) (Amendment) (No. 2) Regulations 2012**. Copies of these regulation documents are included in Appendix A of this report.



**Figure 2.1 RTS 006 and RTS 007 cycle signals**  
(Source: *Traffic Signs Manual*)

There is no existing allowance to use a directional arrow for cycle signals. There is also no allowance to add an additional lens to show a constantly lit cycle symbol for distinguishing pedal cycle signals from general traffic signals. An example is shown in Figure 2.2.

There is also no option to show both a cycle symbol and arrow in the same lens, as shown in Figure 2.3.



**Figure 2.2 Blue cycle signal above directional arrows - Copenhagen**  
(Source: *Copenhagenize*)



**Figure 2.3 Cycle symbol and directional arrow in same lens - Utrecht**  
(Source: *Cyclemotions*)

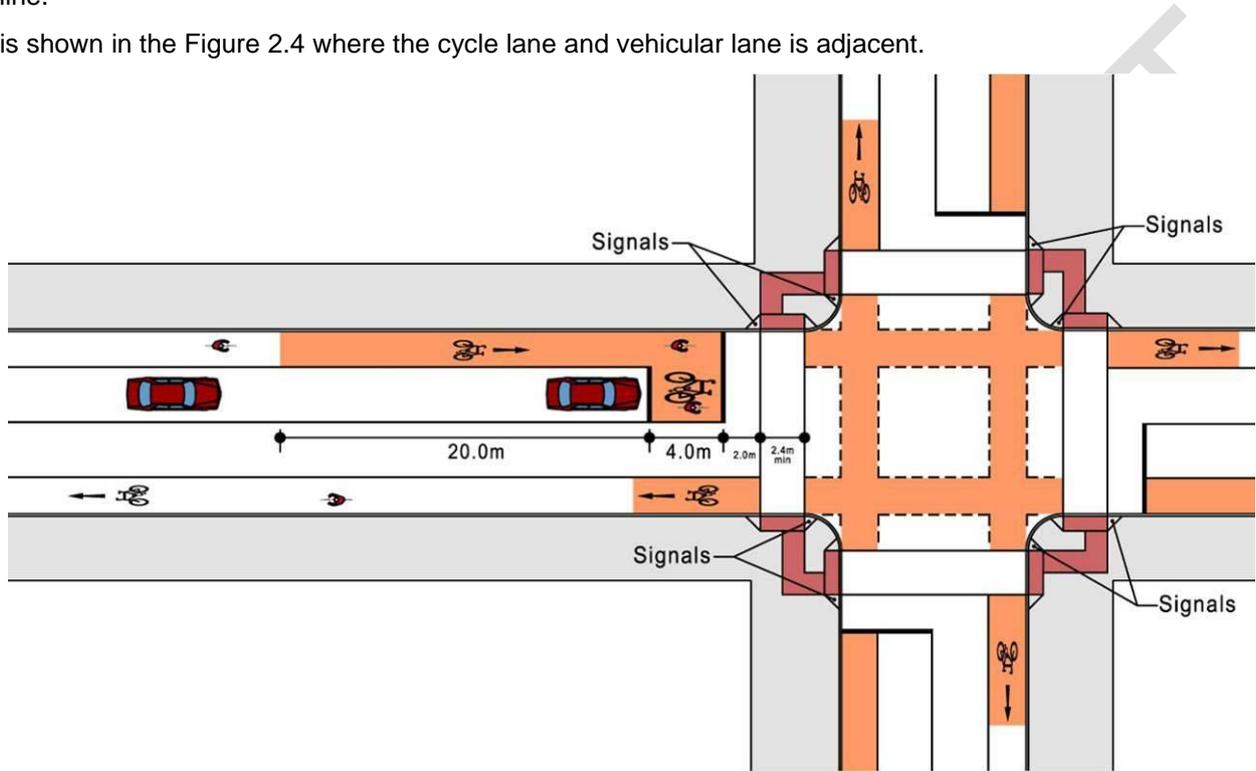
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**2.2 Existing cycle movement control at signalised junctions**

**2.2.1 Primary traffic signals with ASL**

Where cyclists are not segregated from mainline traffic, cycle movements are controlled via the primary vehicle traffic signal heads at signalised junctions. Cyclists must wait at the stop line and proceed at the same time as other vehicular traffic when the signal is green. Where road geometry and traffic conditions allow, a cycle lane and ASL (advanced stop line) is used to improve the position of the cyclist by placing them ahead of vehicular traffic at the stop line.

This is shown in the Figure 2.4 where the cycle lane and vehicular lane is adjacent.



**Figure 2.4 Cycle movements controlled by primary traffic signals - with ASL**

(Source: National Cycle Manual)

**Advantages**

- ✓ Can be provided at any junction where there is sufficient space to provide a lead in cycle lane to the stop line.
- ✓ If used in conjunction with an ASL then cyclists are ahead of vehicles and not to the left where they may not be seen by turning vehicles.
- ✓ Does not have an effect on the capacity of the junction if signal timings are maintained.

**Disadvantages**

- ✗ Cyclists do not have any priority over vehicles as they proceed at the same time as vehicles.
- ✗ Safety issues on multi lane arms, ASLs suitable for single lane approaches only.
- ✗ ASL does not provide any advantage to cyclists approaching the junction during “free flow”, when traffic is already in motion during the green signal.

**Applications**

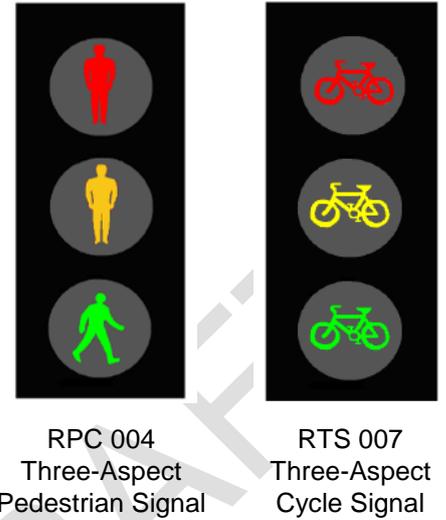
- Where there is a desire for cyclists to use the route.
- If used in conjunction with an ASL, to remove cyclists from the left side of vehicles out of the path of turning vehicles while waiting for a green signal.

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**2.2.2 Cyclist and Pedestrian Crossing (Toucan Crossing)**

The Toucan is a signal-controlled road crossing where cyclists and pedestrians cross the road at the same time, sharing the same space. As cyclists and pedestrians cross in the same space and at the same time, there is no need to prohibit cyclists from making turns. There are separate signal heads for cyclists and pedestrians, as shown in Figure 2.5. Both cyclists and pedestrians proceed at the same time when both signals are green.

Toucan crossings are usually restricted to mid block sections but can be used during the all-green pedestrian phase at signalised junctions, as shown in Figure 2.6 below, subject to Department of Transport, Tourism and Sport (DTTAS) approval. Ideally they are only suitable for tight confined junctions, with short cycle times and short pedestrian crossing distances.



RPC 004  
Three-Aspect  
Pedestrian Signal

RTS 007  
Three-Aspect  
Cycle Signal

**Figure 2.5 Toucan crossing signals**  
(Source: Traffic Signs Manual)



**Figure 2.6 Cyclist and Pedestrian (Toucan) crossing at signalised junction**  
(Source: National Cycle Manual)

**Advantages**

- ✓ Can be provided at existing pedestrian crossing facilities where there is an existing all green pedestrian phase.
- ✓ Does not necessarily involve any additional crossing space if the crossing width is sufficiently wide.
- ✓ Does not have an effect on the capacity of the junction if signal timings are maintained.

**Disadvantages**

- ✗ Cyclists and pedestrians are required to cross together, not ideal where there are large volumes of both.
- ✗ Causes particular difficult for Mobility Impaired Pedestrians who might be concerned about conflicting with cyclists.

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### Applications

- Where there is an existing all green pedestrian phase and sufficient room for cyclists to cross adjacent to pedestrians
- Where cyclists wish to make a right turn but there are no dedicated facilities for them to do so, particularly important for less confident cyclists.
- Where there is a desire for pedestrians and cyclists to cross a road but insufficient space to provide separate crossings.
- Where cyclists need to cross the road from an off road cycle facility.

### 2.2.3 Cycle signals

Cycle signals, as shown in Figure 2.7, have been incorporated into many junctions in the Dublin City Council area, particularly at junctions on the segregated cycle tracks along the Grand Canal Cycle Route.

Cycle signals are used in conjunction with mainline traffic signals to control cycle movements separately from vehicular or pedestrian movements. They can be installed at signalised junctions to indicate cycle signal phases and other cycle-specific timing strategies. Cycle signals are typically used to improve identified safety or operational problems involving cycle facilities or to provide guidance for cyclists at junctions where they may have different needs from other road users (e.g., cycle only movements, advanced cycle green time).

Appropriate regulations, **S.I. No. 331/2012 - Road Traffic (Signs) (Amendment) Regulations 2012** and **S.I. No. 332/2012 - Road Traffic (Traffic and Parking) (Amendment) (No. 2) Regulations 2012**, are in place for cycle signals but they have yet to be incorporated into the current addition of the DTTAS Traffic Signs Manual (TSM). Currently the only cycle signals provided in the TSM are RTS 006 and RTS 007 for use at Toucan Crossings ('Nested Toucans'), as discussed in the section previously.



**Figure 2.7 Cycle signals**  
(Source: *ITS International*)

#### Advantages

- ✓ Separates bicycle movements from conflicting vehicle, light rail, or pedestrian movements.
- ✓ Provides priority to bicycle movements at junctions (e.g., a leading bicycle interval).
- ✓ Accommodates bicycle-only movements within signalised junctions (e.g., providing a phase for a contra-flow cycle lane that otherwise would not have a phase). Through bicycle travel may also occur simultaneously with parallel vehicle movement if conflicting vehicle turns are restricted.
- ✓ Protects cyclists in the junction, which may improve real and perceived safety at high-conflict areas.
- ✓ Improves operation and provides appropriate information for cyclists.
- ✓ Helps to simplify cycle movements through complex junctions and potentially improves operations or reduce conflicts for all modes.

#### Disadvantages

- ✗ They do not provide for separate control of different cyclist movements, i.e. where you want to permit left turning cyclists but hold straight ahead cyclists.
- ✗ Not included in the Traffic Signs Manual
- ✗ No guidance for implementing them in Ireland.
- ✗ Can have significant impact on vehicular capacity at junctions.

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### **Applications**

- Where a stand-alone cycle track or shared-use path crosses a road, especially where the needed cycle clearance time differs substantially from the needed pedestrian clearance time.
- To split signal phases at junctions where a predominant cycle movement conflicts with a main vehicle movement during the same green phase.
- At junctions where a cycle facility transitions from a cycle track to a cycle lane, if turning movements are significant.
- At junctions with contra-flow cycle movements that otherwise would have no signal indication and where a normal traffic signal head may encourage wrong-way driving by vehicle.
- To give cyclists an advanced green (like a leading pedestrian interval), or to indicate an “all-cycle” phase where cyclist turning movements are high.
- To make it legal for cyclists to enter a junction during an all-pedestrian phase.
- At complex junctions that may otherwise be difficult for cyclists to navigate.
- At junctions with high numbers of cycle and vehicle collisions.
- At junctions near schools (primary, secondary, and university).

### **3 Conflict Problems**

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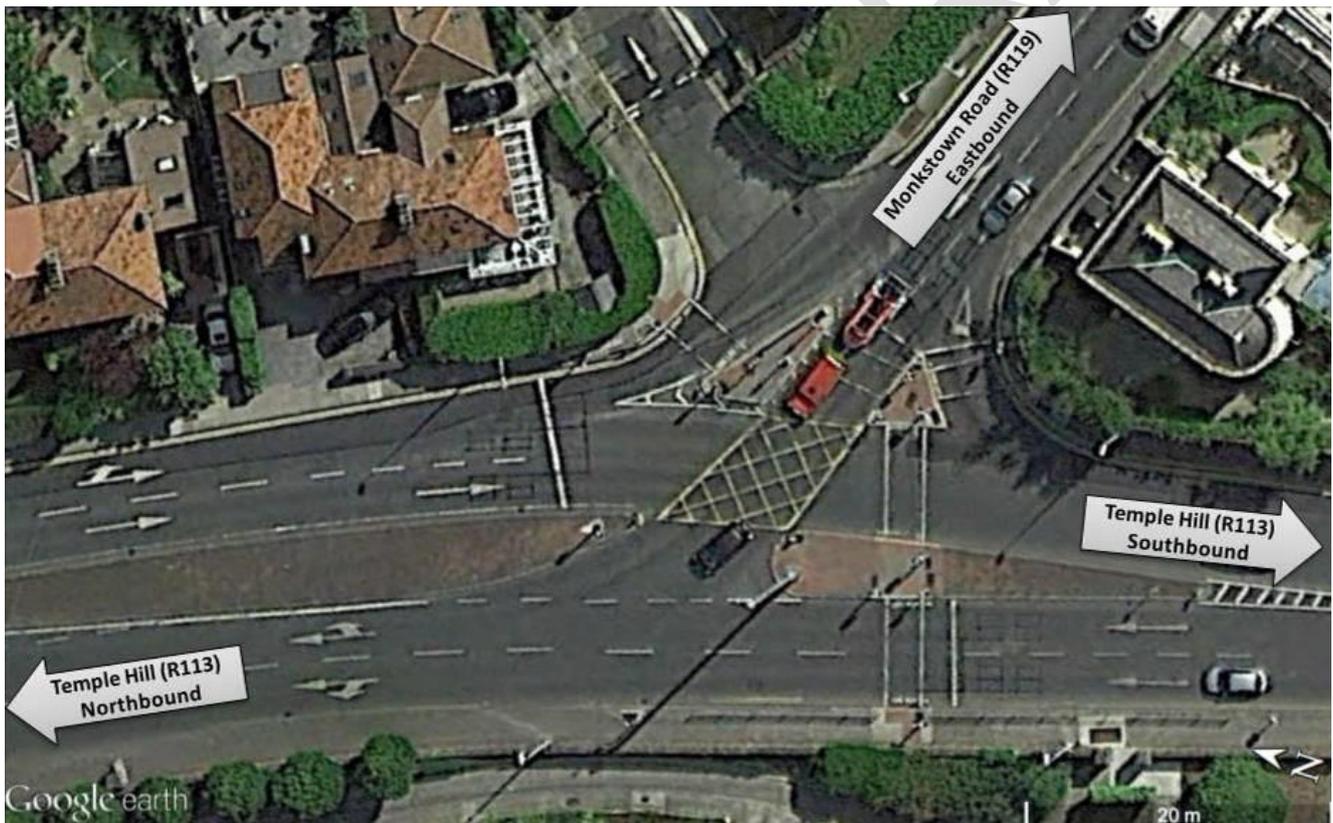
### 3 Conflict Problems

#### 3.1 Left turning traffic conflict – Directional cycle signals

This type of conflict occurs most often at junctions with heavy left turning vehicular movements adjacent to a left side cycle facility. The conflict occurs when a left turning vehicle fails to see or give way to a cyclist proceeding straight ahead at the junction. This is particularly dangerous when there are a number of heavy goods vehicles (HGVs) turning left at the junction as they have a reduced field of vision from their left hand side wing mirror and often do not see cyclists approaching on their inside.

##### 3.1.1 Conflict Example: Monkstown Road (R119)/ Temple Hill (R113)

This junction is located in between Monkstown and Blackrock in close proximity to N31, connecting Temple Hill (R113) to Monkstown Road (R119). It provides access to a number of residential areas in Monkstown as well as access to Scoil Lorcaín off Monkstown Road. The junction is shown in its current configuration in Figure 3.1 below.

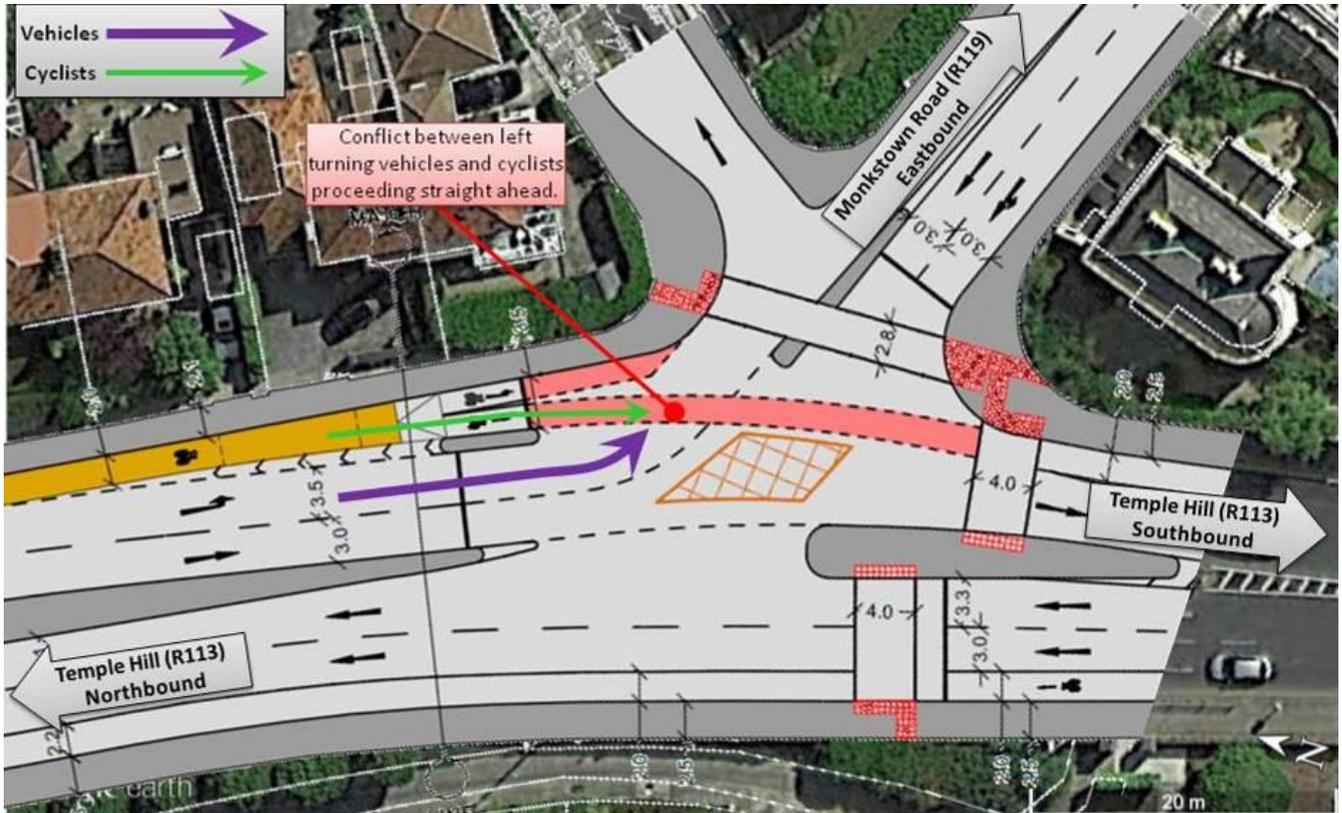


**Figure 3.1 Left turning traffic conflict with straight ahead cyclists – Monkstown Road/Temple Hill Existing**  
(Source: Google Earth)

The above junction is to be reconfigured in the coming months which is likely to generate an increase in the number of cyclist movements at this location. As a result there is an increased likelihood of accidents arising because of this conflicting movement. The reconfiguration of this junction is due to be completed in the Summer of 2015. One of the

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main aims of this scheme is to improve safety for all road users as well as improve permeability and journey times for cyclists and pedestrians. To help achieve this, a redesign of the junction geometry and traffic signal control is being implemented which will separate cycle movements from vehicular movements at this junction. The proposed design can be seen in Figure 3.2. The operation of the signals will be explained in more detail in Section 5 of this report.



**Figure 3.2 Left turning traffic conflict with straight ahead cyclists – Monkstown Road/Tempel Hill Proposed**  
(Source: AECOM design)

Although this geometric design has greatly improved facilities for cyclists, without revised signal staging plan it does not remove the conflict between vehicles turning left from Temple Hill into Monkstown Road eastbound and cyclists continuing straight ahead along Temple Hill southbound, as shown in the figure above.

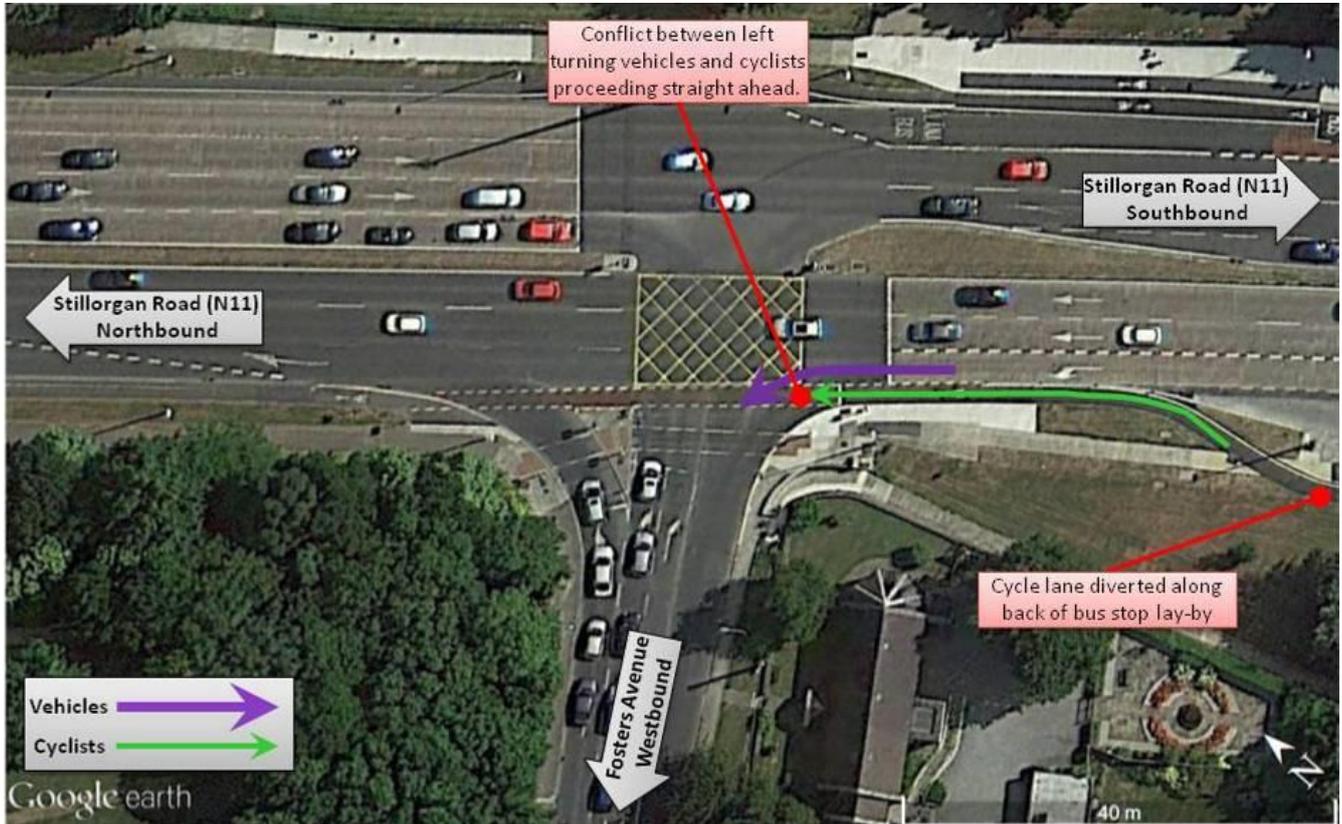
To improve safety for cyclists approaching this junction from Temple Hill southbound the solution for this junction would require separate controls for straight ahead and left turning cyclist movements. This would allow left turning vehicles and cyclists to receive a green light while cyclists wishing to proceed straight ahead would receive a red light, removing the conflict between these opposing movements.

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### 3.2 Left turning traffic conflict – Warning sign for turning vehicles

#### 3.2.1 Conflict Example: Foster's Avenue/Stillorgan Road (N11)

This junction is located in Mount Merrion, Dublin adjacent to University College Dublin's (UCD) Belfield campus. Fosters Avenue provides access the Owentown entrance to UCD and to the National Institute for Bioprocessing Research and Training (NIBRT) and is an important orbital route around the city. It also provides access to a number of residential areas in Mount Merrion. The junction is shown in the Figure 3.3 below.



**Figure 3.3 Left turning traffic conflict with straight ahead cyclists – Foster's Avenue/N11**

(Source: Google Earth)

The main conflict at this junction is between vehicles turning left from the N11 into Foster's Avenue westbound and cyclists proceeding straight ahead along the N11 northbound. The cycle lane is diverted along the back of the bus stop lay-by on the approach to the junction which reduces motorists' awareness of the cycle lane to their left. Due to this, vehicles do not always see cyclists when turning left into Fosters Avenue and as a result turn into the path of cyclists proceeding straight ahead, often at speed.

Measures have been taken previously to highlight the cycle route across the mouth of the junction with Fosters Avenue by using red coloured surface treatment to distinguish the western cycle lane from the rest of the carriageway. However, there are still safety issues particularly when visibility is poor, such as on winter mornings and evenings when it is dark during peak hours.

The solution for this junction would need to improve driver awareness of cyclists as they approach the junction northbound, possibly through visual measures such as signs, road markings or traffic signals.

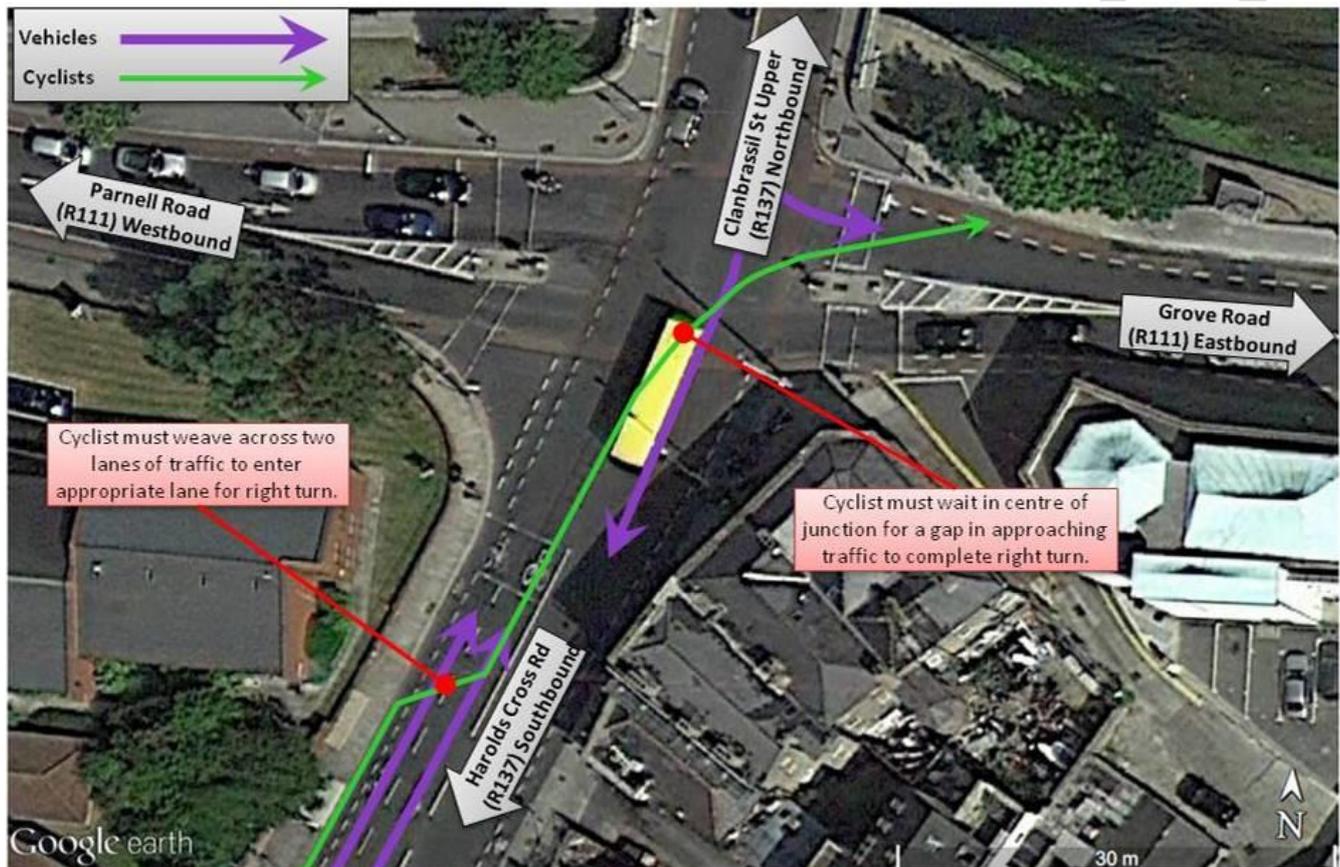
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### 3.3 Right turning cyclists conflict – “Box turns”

This occurs at any junction where cyclists wish to turn right. The conflict occurs when a cyclist needs to move across vehicular lanes to adopt their position in the carriageway for turning right. This is particularly dangerous when there are multiple lanes for the cyclists to move across and no right turn only dedicated vehicular lane. This puts the cyclist in a vulnerable position on the approach to and at the junction.

#### 3.3.1 Conflict Example: Harolds Cross Bridge

This junction is located at Harolds Cross, south of Dublin City, adjacent to the Grand Canal. It provides access from south Dublin to the city centre and provides access to the orbital canal route along the south side of the Grand Canal. The junction is shown in Figure 3.4 below.



**Figure 3.4 Traffic conflicting with right turning cyclists – Harold's Cross Bridge**  
(Source: Google Earth)

The conflict at this junction occurs between cyclists approaching from Harolds Cross Road northbound wishing to turn right towards Grove Road eastbound and vehicles approaching from Harolds Cross Road northbound wishing to proceed straight ahead.

To turn right at this junction, cyclists must move from the left side cycle facility across two lanes of traffic to adopt their position for turning right. The lane for right turning vehicles is also a straight ahead lane leading to a conflict between cyclists wishing to turn right and vehicles proceeding straight ahead. Due to the difficulty in executing a right turn at this junction many cyclists dismount their bicycles and navigate the junction using the pedestrian crossings. ASLs have been provided to allow cyclists to move to the front of traffic queues but there is no area for right turning cyclists to wait out of the line of straight ahead vehicles.

A solution for this junction would need to provide a simplified and safer option for cyclists wishing to turn right.

## 4 International Solutions

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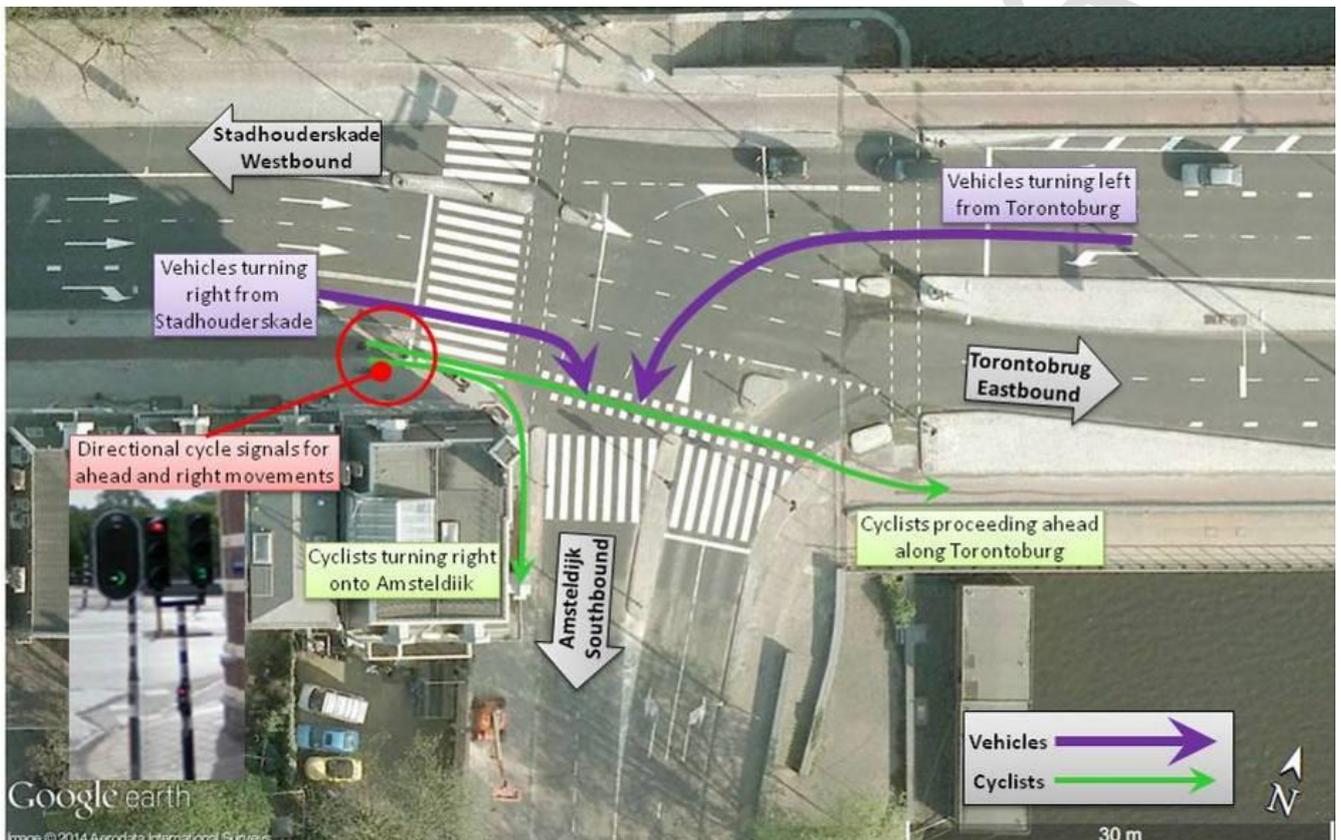
## 4 International Solutions

### 4.1 Left turning traffic conflict – Directional cycle signals

This operates by providing separate signal heads for cyclists at signalised junctions with separate aspects for each cycle movement, usually ahead and right turning movements (ahead and left in Ireland). These signals allow each cycle movement to be controlled separately, allowing more phasing options to reduce conflicting cyclist/vehicular movements at signalised junctions.

#### 4.1.1 Case Study – Amsterdam - Separate bicycle directional traffic signals

In Amsterdam, near the Heineken Museum, an example of directional cycle signals can be seen at the junction of Stadhouderskade / Amsteldijk / Torontobrug. The junction is shown in Figure 4.1 below.



**Figure 4.1 Directional cycle signal - Amsterdam**  
(Source: Google Earth - S100 156, 1074 BC Amsterdam)

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At this junction there are separate directional signals for cyclists at the corner of Stadhouderskade / Amsteldijk, as shown in Figure 4.2. These signals separately control cyclists approaching from Stadhouderskade wishing to proceed ahead along Torontobrug or cyclists wishing to turn right onto Amsteldijk.

The ahead cycle signal is red when vehicles turning right from Stadhouderskade have a green light or when vehicles turning left from Torontobrug have a green light to prevent conflict between cyclists and vehicles.



**Figure 4.2 Full height directional cycle signal - Amsterdam**  
(Source: Google Earth - S100 156, 1074 BC Amsterdam)

This arrangement is commonplace across Europe with varying examples seen in The Netherlands, Germany and Denmark, as shown in Figures 4.3 to 4.10. A version of this arrangement is also proposed in London, as shown in Figure 4.11.

In Utrecht, directional cycle signals show both a cycle symbol and an arrow in the same lens. These directional cycle signal heads are placed at a greater height and have larger lenses than regular low level cycle signals. As the primary cycle lens is larger in size and at a greater height it makes it easier for approaching cyclists to see the directional arrow. However, the cycle signal height and lens size is still smaller than that used for main traffic signals, and is orientated away from the view of mainline traffic, to avoid any confusion for motorists.

There are varying uses for directional cycle signals in Utrecht. In Figure 4.3, a filter arrow specifically for cyclists is used to allow cyclists to turn right (equivalent of left turn for Ireland) when the main signal is red for all other traffic. This works particularly well where there is a cycle lane/track for cyclists to enter after the junction, reducing the risk of any conflict with traffic approaching from the left.



**Figure 4.3 Filter arrow for right turning cyclists – Utrecht**  
(Source: Cyclemotions)

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Another scenario in Utrecht uses separate directional cycle signals, in conjunction with separate approach lanes, for left turning and right turning cyclists, as shown in Figure 4.4. Here, the directional cycle signals are used to prevent the opposing conflict between right turning vehicles and left turning cyclists. Left turning cyclists have a red light while right turning vehicles and cyclists have a green light.



**Figure 4.4 Separate directional signals for left turning and right turning cyclists - Utrecht**  
(Source: Cyclemotions)

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In Germany, these cycle signals are commonly low level mini signal heads with separate arrow signals for each direction and a blue illuminated bicycle symbol above the arrow signals, shown in Figures 4.5 and 4.6.

There is an example in Potsdam, Figure 4.7, of the arrow being shown with the bicycle signal in the same lens but in this instance it makes the direction of the arrow less visible to cyclists approaching the junction and is not recommended.



**Figure 4.5 Directional cycle signal - Leipzig**



**Figure 4.6 Distinct sets of low-level cycle signals controlling different manoeuvres - Berlin**  
(Source: *International Cycling Infrastructure Best Practice Study*)



**Figure 4.7 Directional cycle signal - Potsdam**  
(Source: *Federal Highway Agency*)

In Copenhagen, both low level and overhead cycle signals are used with directional arrows to control different movements for cyclists. The arrangement consists of a blue illuminated bicycle symbol above the arrow signals. In Figure 4.8 the signal arrangement is also used to indicate a dedicated left turn phase for cyclists, which would be the equivalent of the right turn in Ireland. This shows that directional signals could also be used to remove the conflict with opposing traffic by providing a separate phase for right turning vehicles and cyclists.



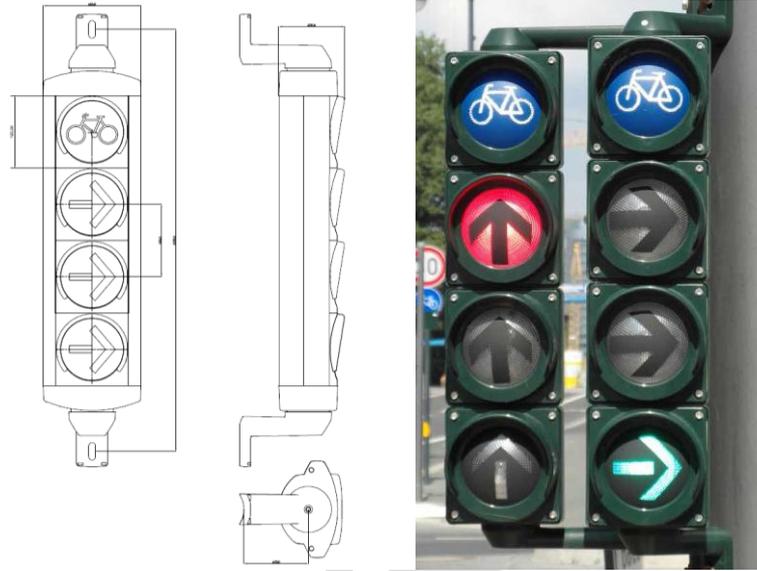
**Figure 4.8 Low level directional cycle signal - Copenhagen**  
(Source: *Copenhagenize*)



**Figure 4.9 Overhead directional cycle signal - Copenhagen**  
(Source: *Cykel Smart*)

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There are a number of different configurations for these signal heads on the market, but the most common configuration found in Europe is four lens signal heads with a constantly illuminated white bicycle on a blue background lens on top and green, yellow, and red lens arrows underneath, as shown in Figure 4.10.



**Figure 4.10 Typical cycle directional signals – FUTURA 100 Hauptabmessungen**

(Source: *Elmore & International Cycling Infrastructure Best Practice Study*)

In the UK the configuration shown in Figure 4.11 is proposed for use in London. According to TSRGD 2002 (Traffic Signs Regulations and General Directions), Diagram 3000.2 “Light signals for the control of vehicular traffic consisting solely of pedal cycles”, governed by Regulation 33, may have any one of the signs permitted in Direction 44A affixed to the signal post/head.

In accordance with these regulations, it is proposed to use pedal cycle signals above an illuminated direction symbol. If this configuration was to be used to separate left and straight ahead movements, another set of signals would be required with a blue illuminated left arrow in the bottom aspect. The concern with this arrangement is that cyclists may not see the directional arrows at the bottom of the signal head and proceed during the left only cycle green stage.

There is currently no option within the UK regulations to use the more common configuration of a blue cycle symbol above directional arrows for pedal cycle signal heads. There is also no regulation to allow low level signals, though this is to be included in the TSRGD 2015 update due in March.



**Figure 4.11 Cycle signals with added directional aspect - UK**

(Source: *Swarco*)

**Implementation in Ireland**

Cycle signals are already in use in Ireland but currently do not provide the option to control different cycle movements separately. These signals could be introduced at junctions where there is a particular problem for cyclists proceeding straight ahead and turning vehicles conflicting such as the junctions discussed in Section 3.0. The arrangement for the UK shown in Figure 4.11 is permissible in Ireland and could be trialled with some modifications to existing cycle signals. However, this UK configuration is not commonly used and would not be considered best practise and is therefore not recommended as a long term solution.

Capabilities on project:  
Transportation

## 4.2 Left turning traffic conflict – Warning sign for turning vehicles

For left turning traffic, or right turning traffic as is the case in most other countries, there is a recognised problem of turning vehicles conflicting with cyclists proceeding straight ahead from nearside cycle facilities. The National Cycle Manual provides a number of solutions to remove straight ahead cyclists from the path of turning vehicles at junctions, such as segregation, streaming lanes approaching junctions, shifting the cycle path to the right, etc. However, these options are not always feasible due to available width constraints or traffic conditions, as well as financial costs.

At signals in some non-UK/Ireland cities where cycling is prevalent, crossing cyclists and pedestrians get a green signal at the same time as parallel ahead and associated turning general traffic; the latter being obliged by law to give way to the former. Crossings are often zebra-striped to reinforce this behaviour. In Ireland, the National Cycle Manual allows for a combined cycle and pedestrian 'scramble' stage, subject to Departmental approval. It is described as a 'junction toucan' on the basis that, it being accepted that pedestrians and cyclists can mix at standalone crossings, a combined 'scramble' stage is simply extending the concept to all arms of a junction. However, this option is not always feasible for a junction or necessary on all arms of a junction.

In other countries across Europe and in USA and Canada there are some alternative solutions that can be used on singular arms of junctions to reinforce pedestrian/cyclist priority over turning vehicles. These options are discussed in detail below.

### 4.2.1 Case Study – USA/Canada - Warning sign for turning traffic to yield to pedestrians/cyclists

In the USA and Canada a specific regulatory sign is used at junctions to warn right turning vehicles to yield to cyclists. Although there are numerous examples of these signs in use in the US and Canada they are not currently standard and are subject to approval from their respective transport authorities:

- US Department of Transportation Federal Highway Administration (FHWA)
- Transport Association of Canada (TAC)

Examples of these signs are shown in Figures 4.12, 4.13 and 4.14.

These signs are placed on or adjacent to the signal poles near the signal heads so drivers can see them easily while waiting at the signals or on approach to the junction. The signs are kept simple with minimal symbols or text to ensure they are easy for all road users to understand.

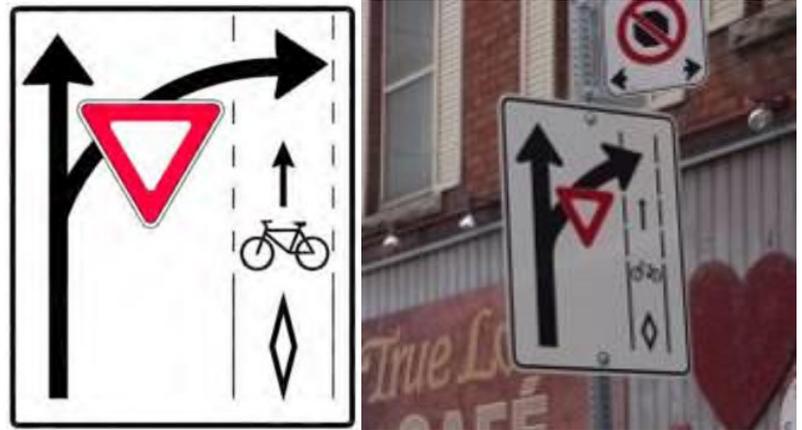


**Figure 4.12 Traffic to yield to cyclists sign - USA**  
(Source: NACTO Urban Bikeway Design Guide)

Capabilities on project:  
Transportation

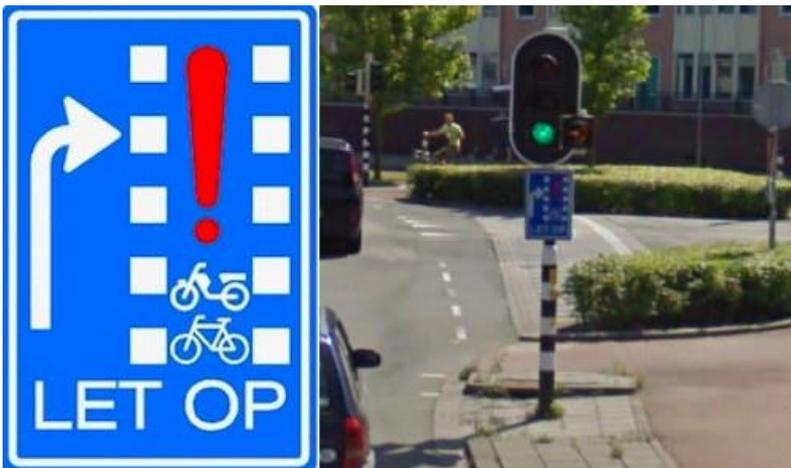


**Figure 4.13 Traffic to yield to cyclists sign - Vancouver**  
(Source: *Take The Lane*)



**Figure 4.14 Traffic to yield to cyclists sign, Transportation Association of Canada Sign - Toronto**  
(Source: *Biking in a Big City*)

Similar signs are also found at junctions in Europe. Figure 4.15 shows an example of a sign at a junction in the Netherlands used in conjunction with a flashing amber arrow. This has the text “let op”, translated as “look out” in English, and an exclamation point to draw turning vehicles attention to the cycle lane on their right. Figure 4.16 shows the “let op” sign used as a signal aspect in Utrecht.



**Figure 4.15 “Look out” for cyclists when turning sign - Netherlands**  
(Source: *Pedestrianise London*)



**Figure 4.16 “Look out” signal aspect cautioning right-turning drivers to watch for crossing cyclists and pedestrians - Utrecht**  
(Source: *International Cycling Infrastructure Best Practice Study*)

Capabilities on project:  
Transportation

**4.2.2 Case Study – Germany - Flashing amber for turning traffic to yield to pedestrians/cyclists**

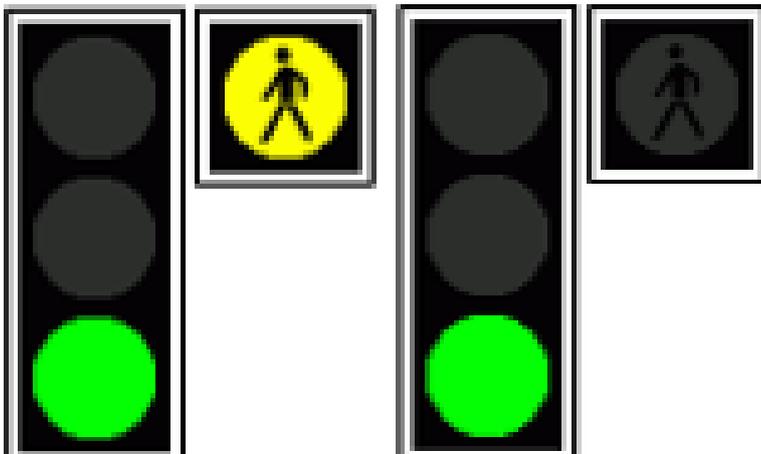
In Germany, right turning traffic must always watch for and yield to pedestrians and cyclists, as shown in Figure 4.17.

In some instances, a flashing amber pedestrian symbol (or pedestrian/cycle symbol) is used at signalised junctions to reinforce /warn vehicles that they must yield to pedestrians and cyclists when turning right even though vehicles have a green signal. This arrangement is shown in Figure 4.18.

This arrangement may also be used for vehicles turning left (or right in Ireland), as shown in Figure 4.19.



**Figure 4.17 Drivers must give way to cyclists (and parallel pedestrians) when turning right – Munich**  
(Source: *International Cycling Infrastructure Best Practice Study*)



**Figure 4.18 Yield for pedestrians and cyclists when turning signals - Germany**  
(Source: *Getting around Germany*)

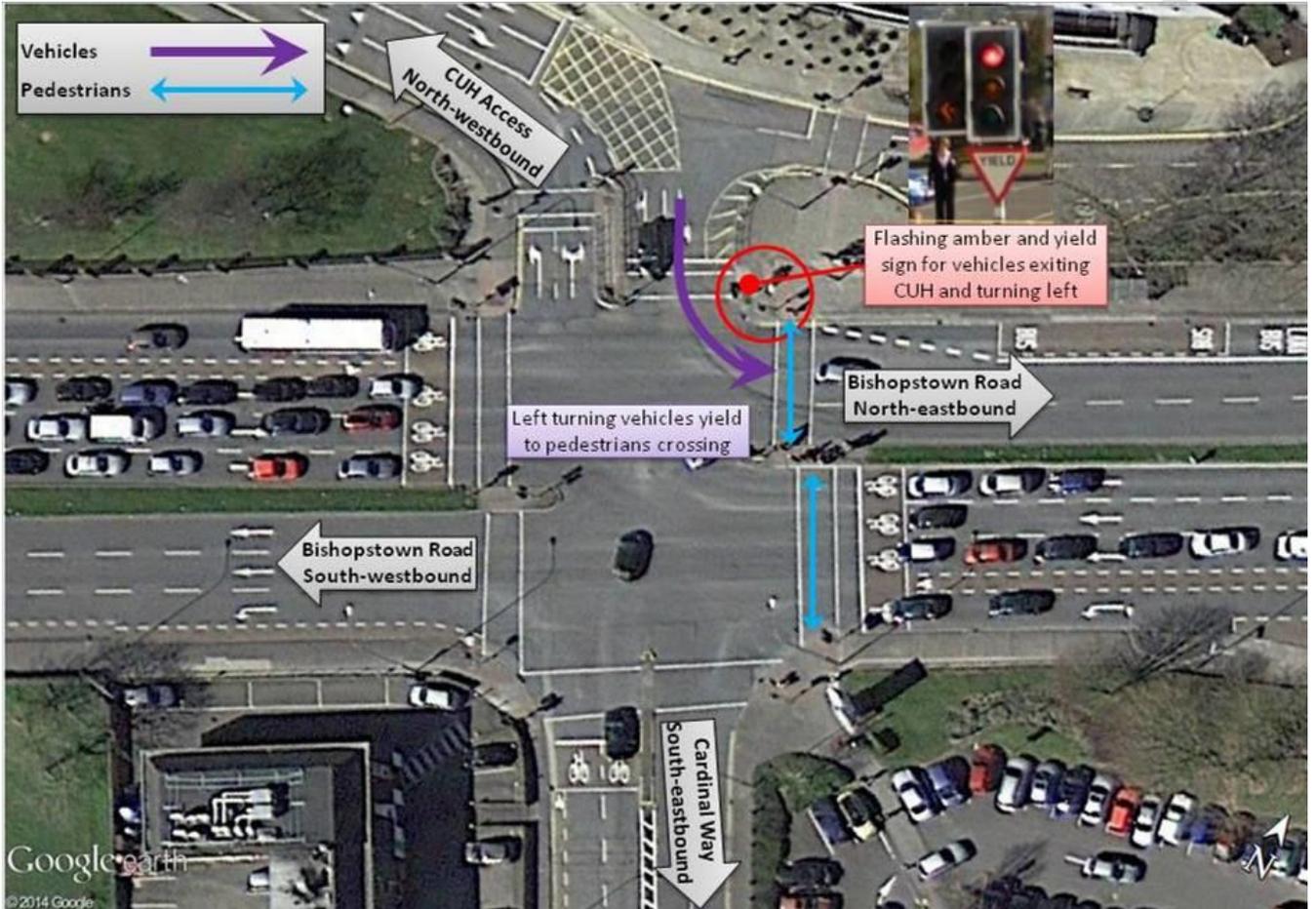


**Figure 4.19 The flashing amber indicates that drivers must give way to cyclists and pedestrians when making a left turn – Munich**  
(Source: *International Cycling Infrastructure Best Practice Study*)

Capabilities on project:  
Transportation

**Implementation in Ireland**

In Ireland, it is an unfamiliar arrangement for motorists to be allowed to proceed when pedestrians also have a green signal. To inform motorists to give way to pedestrians when proceeding at traffic signals a flashing amber aspect has been used, although it is not covered under current design guidelines. An example of a flashing amber signal arrangement, similar to the one in Germany, is in operation at the access from Cork University Hospital (CUH), shown in Figure 4.20. This access forms part of a signalised junction with Bishopstown Road, leading south-west towards the N40 ring road and north-east towards the city centre, and Cardinal Way, connecting to Wilton Shopping Centre and local businesses.



**Figure 4.20 Left turning traffic yields to pedestrians crossing – CUH access, Cork**  
(Source: Google Earth)

Capabilities on project:  
Transportation

At this junction vehicles turning left from CUH onto Bishopstown Road north-eastbound have a flashing amber arrow while pedestrians have a green signal. The accompanying yield sign indicates to drivers that they must yield to pedestrians who are crossing. This is shown in Figure 4.21.



**Figure 4.21 Flashing amber arrow and yield sign for exiting vehicles turning left – CUH access, Cork**  
(Source: Google Earth)

WORKING DRAFT

Capabilities on project:  
Transportation

#### 4.2.3 Case Study – Denmark - Intelligent sensors/diodes indicating approaching cyclists

In Denmark, a number of systems have been trialled to warn motorists of cyclists when approaching a junction. One such system, operating in Copenhagen, uses blinking diodes in the carriageway to warn vehicles of the presence of cyclists. The LED Lane Lights are located on the last stretch of the cycle lane leading up to a junction. They operate through sensors in the carriageway. When cyclists are detected, the lights start flashing and alert turning vehicles to cyclists on their right. An example of these lights is shown in Figure 4.22.

A sensor is located in the carriageway on the cycle lane at the traffic signals, in order to register cyclists waiting for the light to change. When the lights turn green, the lane lights start flashing if cyclists are present. There is also another sensor 25 metres before the signals.

If the lights are green and a cyclist is approaching the junction at speed, the sensors are triggered and the lane lights start flashing, allowing the cyclist to continue through the intersection.

The lights are visible in one direction and are aimed at vehicles looking in their side mirror.



**Figure 4.22 LED Bike lane lights - Copenhagen**

(Source: [Copenhagenize](#) & [Vimeo](#))

Another system, tested in Grena, uses a See-mi chip installed in the bicycle handlebars to trigger a warning light for vehicles at the traffic lights. When a bicycle is approaching a traffic light, the reflector chip on the bike transmits a signal to a receiver installed on the traffic lights at the junction. This turns on a signal at the traffic light, shown in Figure 4.23, which tells vehicles that there is a cyclist in a potential blind spot, urging drivers to be extra attentive.

As an alternative to placing a microchip in each bicycle, loops could be placed in the carriageway to detect cyclists approaching the junction and trigger the warning lights.



**Figure 4.23 See-Mi warning signal to vehicles of cyclists - Grena**

(Source: [Mercon](#) & [SeeMi](#))

#### **Implementation in Ireland**

A system similar to these, or a combination of the two, could be implemented in Ireland at junctions where there is a conflict issue between cyclists and left turning vehicles. It would be particularly applicable in situations where there is poor visibility such as during evening rush hour in the winter months when low light levels and weather conditions can reduce cyclists' visibility to vehicles.

Capabilities on project:  
Transportation

**4.3 Right turning cyclists conflict – Box turn**

At signalised junctions, making opposed turns (to the left in continental Europe and the USA; to the right in the UK and Ireland) is a manoeuvre which is particularly difficult and potentially dangerous for cyclists, especially where cycling takes place in nearside lanes/tracks. In order to make the opposed turn in the conventional manner, cyclists would need to signal and move into or across one or more lanes of moving motor traffic. This is particularly difficult, and greatly diminishes the subjective safety of cycling, where:

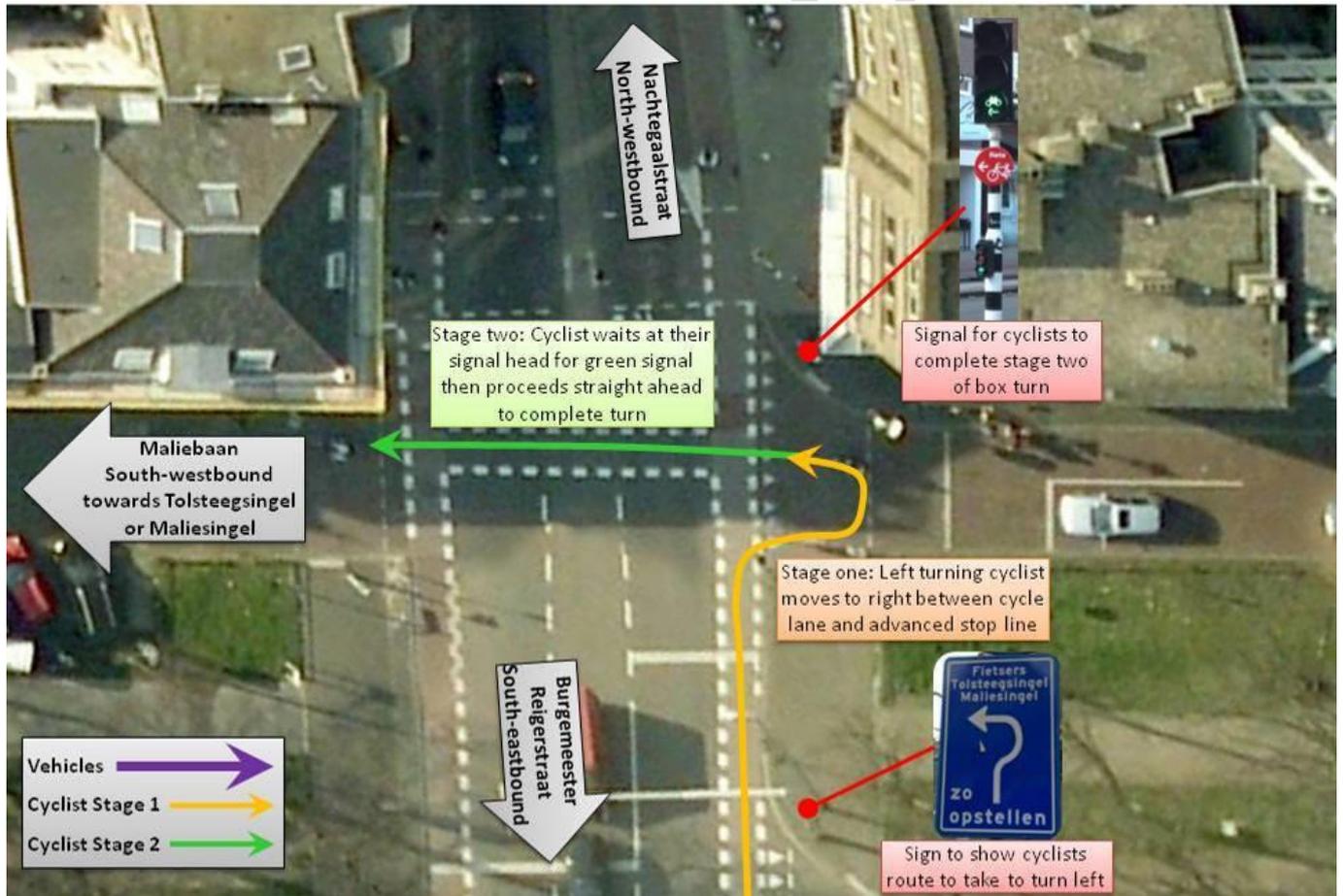
- There is more than one traffic lane to manoeuvre across
- Traffic volumes and speeds are relatively high
- Cyclists have to wait in an exposed location in the middle of the junction to complete the turn.

In both Europe and the USA/Canada, this conflict is mitigated at some junctions through the implementation of box turns or “box turns”. Examples of how these are used are detailed in the case studies below.

**4.3.1 Case Study – Utrecht, The Netherlands - Box turn signs and signals**

In Utrecht, a series of signs and signals are used to inform cyclists how to complete a two-stage left turn (equivalent of right turn in Ireland). It should be noted that cyclists do not have to use this method to turn left in The Netherlands, it is installed at junctions where it is a logical and safe alternative to making a direct left turn, particularly for less confident cyclists.

Here, cyclists can move to the right out of the cycle lane into the area between the vehicular stop line and the cycle lane and wait for a specific cycle green signal for turning cyclists before proceeding. In this instance there is no formal area marked on the road for cyclists to wait in. Figure 4.24 shows an overview of the junction and how the box turn is executed.



**Figure 4.24 Box turn signs - Utrecht**  
(Source: Cyclemotions)

Capabilities on project:  
Transportation

As shown in Figure 4.25, cyclists who wish to turn left towards Tolsteegsingel or Maliesingel are guided to “do as shown” on the blue and white sign as they approach the junction. This sign shows cyclists that to make a left turn they have the option of first manoeuvring to the right, before turning left to complete their turn.



**Figure 4.25 Box turn sign for Stage 1 - Utrecht**  
(Source: Cyclemotions)

At this particular junction there is no secondary traffic signal on the other side of the road to inform cyclists when they can proceed with the second stage of their turn. In this instance, cyclists turning left have been provided with a separate signal head to inform them when they can complete their turn, as shown in Figure 4.26. At this junction the signal head has been placed beyond the main primary signals between the cycle lane and the advanced stopline but is angled towards cyclists waiting to complete the two-stage left turn. There is also a red sign provided underneath the cycle signals to confirm that these signals are for cyclists turning left.



**Figure 4.26 Box turn signal for Stage 2 - Utrecht**  
(Source: Cyclemotions)

Figure 4.27 shows that cyclists completing stage two of this box turn receive a green signal at the same time as the traffic behind them.

Capabilities on project:  
Transportation



**Figure 4.27 Box turn green signal for cyclists and vehicles - Utrecht**  
(Source: Cyclemotions)

WORKING DRAFT

Capabilities on project:  
Transportation

#### 4.3.2 Case Study – USA/Canada - Box turn Queue Boxes

The typical international best practice is a box turn (also referred to as a hook turn or Copenhagen left). The turn queue box is placed in a protected area, typically between the cycle lane and the pedestrian crossing. Figure 4.28 and Figure 4.29 below show how the turn queue box works. In the USA/Canada, box turn queue boxes offer cyclists a safe way to make left turns at multiple-lane signalised junctions from a right side cycle track or cycle lane.



**Figure 4.28 Box turn Queue Boxes - USA**  
(Source: NACTO Urban Bikeway Design Guide)



**Figure 4.29 Box turn Queue Boxes - Canada**  
(Source: *East-West Segregated Bike Lane Pilot Project, Ottawa, Canada*)

In the USA, the following considerations apply to box turn queue boxes:

- It is placed on the side of the pedestrian crossing that is closest to the centre of the junction.
- It is applicable only to left turns (this would be right turns in Ireland).

Capabilities on project:  
Transportation

- In USA, cyclists follow conventional US rules of the road in both parts of the box turn, other than that they merge to the right of through traffic as they enter the junction. The box turn queue box therefore can be installed with or without a traffic signal.
- Cyclists must still negotiate with right-turning traffic (same as when travelling straight ahead) to enter the intersection.
- The turn queue box facilitates the box turn by placing cyclists ahead of the stop line and pedestrian crossing, and to the left of right-turning traffic in the opposing street.

#### 4.3.3 Implementation in Ireland

The National Cycle Manual has guidance on how a box turn can be implemented, where there is sufficient space, to create a safer turning procedure for cyclists. Figure 4.30 below shows a schematic of how the box turn would be implemented. The box turn works by dividing the right turn for cyclist into two parts. Cyclists proceed straight ahead then move to the left to allow other cyclists past them while they wait to complete their right turn. The space beyond the pedestrian crossing to their left is used to provide a turn box for right turning cyclists to wait for the next green signal to complete the right turn. However, some Local Authorities have avoided using these as they feel the lack of a primary signal for the turning movement means they cannot be used under current traffic management regulations.



**Figure 4.30 Box turn or “Stay left to turn right” – Ireland**  
(Source: National Cycle Manual)

## 5 Recommendations

WORKING DRAFT

Capabilities on project:  
Transportation

## 5 Recommendations

### 5.1 Proposed options

A review was undertaken of the international solutions presented in Chapter 4 to determine which would be most suitable for implementation in Ireland. The review focused on the following criteria:

- Safety benefits – Does the solution provide significant safety benefits? Is it still considered international best practise with regard to safety? Are there documented incidences showing this option to be unsafe?
- Conflict resolution – Does the solution remove common conflicts that currently occur at Irish junctions? Can it be applied in a number of instances to resolve issues?
- Ease of implementation – Does it require minor or significant changes both to current legislation and road infrastructure?
- Ease of understanding/recognition – Are the visual signals/symbols/signs intuitive/easy for Irish road users to understand?

From this review the following solutions were considered to meet the desired criteria and are proposed for inclusion in an addendum to the Road Traffic Signs Regulations, the Traffic Signs Manual and the National Cycle Manual, where required.

1. Cycle signals (discussed previously in Chapter 2)
2. Cycle directional signals
3. Left Turn (Traffic) Yield Signals/Sign
4. Box Turns

The application of solutions 2, 3 and 4 is discussed in detail below.

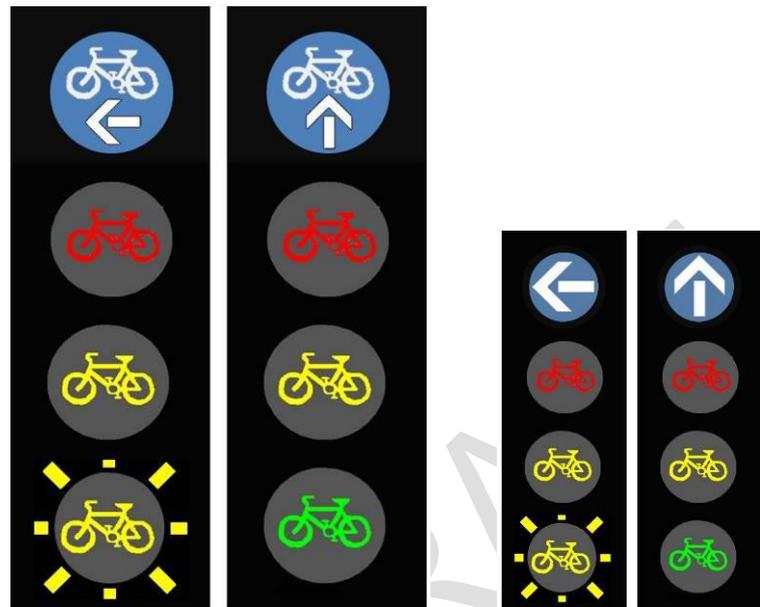
Capabilities on project:  
Transportation

## 5.2 Cycle directional signals

Appropriately designed cycle-specific signals have clear benefits for cycling, especially when used systematically.

These operate in a similar manner to regular cycle signals, as discussed previously in Chapter 2 of this report, but with the added benefit of allowing different directions of cycle streams to be controlled separately. This offers greater flexibility in formulating signal phasing stages at more complex junctions and allows opposing vehicle/cycle movements to be accommodated within the staging.

There are a number of different configurations for these signal heads on the market, but the configuration considered the most appropriate for implementation in Ireland is shown in Figure 5.1. This configuration maintains the existing red, amber and green cycle symbol lenses that are currently used in Ireland for cycle signals.



Full Toucan size (200mm) and low level mini signals (80mm-110mm)

Figure 5.1 Proposed cycle directional signals  
(Source: AECOM sketch)

Where cycle signals are to be used to control separate cycle movements an additional lens will be added above the red cycle lens. This lens will be a constantly illuminated blue lens with a white cycle symbol and arrow to indicate which movement the signals beneath control. The cycle symbol and arrow can only be used in the same lens when the signal lenses are 200mm in diameter. For low level mini cycle signals (80-110mm) the top lens will only contain a constantly illuminated blue lens with a white arrow to indicate the direction that the cycle signals control.

### Advantages

- ✓ Allows control of separate directional streams for cyclists.
- ✓ Manages conflict between cyclists proceeding straight ahead and turning vehicles.
- ✓ Could be used to provide cyclists with an advance green for different movements.
- ✓ Provides clear, unambiguous instructions to all users.

### Disadvantages

- ✗ Signals are regularly ignored by cyclists.
- ✗ Signals, if not orientated/located properly may confuse vehicles that can see the cycle signal head and obey these instead of the main traffic signal heads.
- ✗ Additional cost of providing extra signal heads and configuring the phasing of the traffic signals to include cycle phases.

### 5.2.1 Application

This solution could be applied in the following instances:

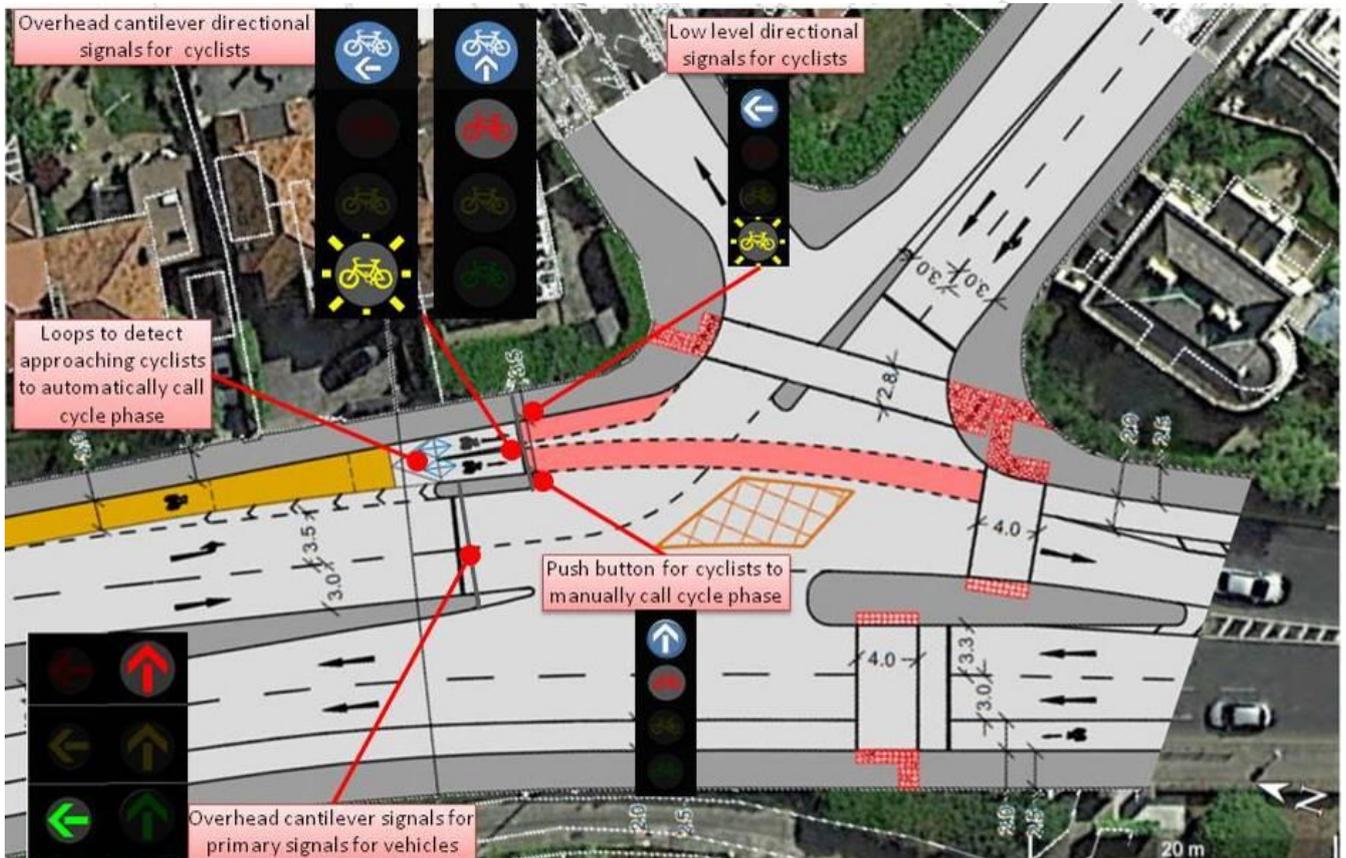
- At signalised junctions.
- At junctions with a high proportion of conflicting turning manoeuvres between cyclists and vehicles.
- Where cyclists require a pre-green/early start for particular movements.
- Where cyclists are allowed to make a turn or movement that vehicles are not.
- At junctions where a contra-flow cycle lane is in place and there are no main traffic signals to control cyclist movements in the contra-flow cycle lane.

Capabilities on project:  
Transportation

An example of how this solution could be implemented is shown in Figure 5.2. It has been applied to the left turn vehicle and straight ahead cyclist conflict problem found at Monkstown Road (R119)/ Temple Hill (R113), as discussed previously in Section 3.1.1.

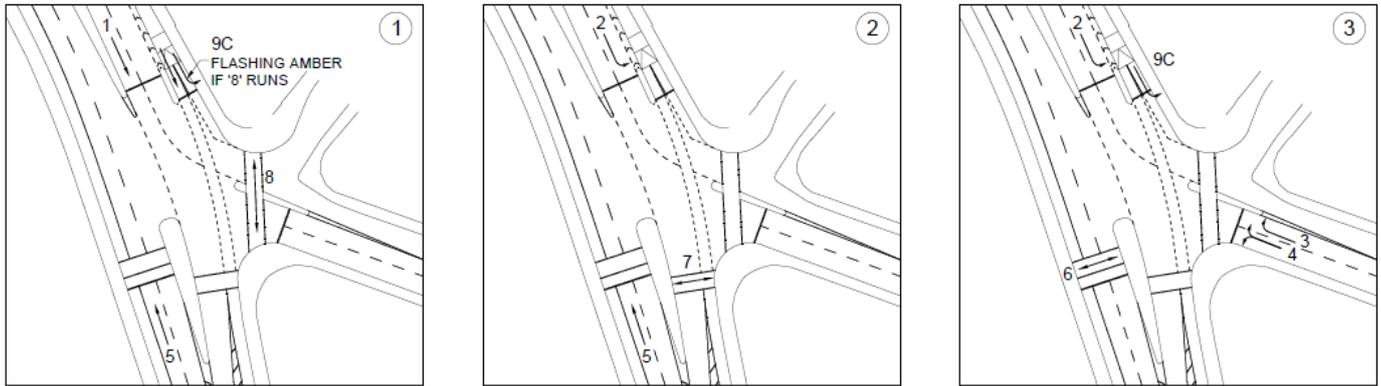
Separate directional signals would be installed for cyclists and vehicles approaching the junction. There would be an overhead cantilever signals for both cyclists and vehicles with “at level” signals for cyclists at the stop line. A push button would be provided at the signal pole in each lane for cyclists to call the relevant cyclist phase. There is the added option of having loops in the cycle lanes for both left turn and ahead cycle movements before the junction to detect cyclists approaching and automatically call the relevant cycle phase at the next opportunity.

Figures 5.2 and 5.3 show that, during Stage 3, while vehicles turning left have a green signal, only cyclists turning left would have a green or flashing amber signal. Cyclists proceeding ahead would be held by a red signal during this stage. Then, during Stage 1, vehicles and cyclists proceeding straight ahead would get a green signal at the same time as the side road pedestrian green phase. There is the option of providing a flashing amber signal for left turning cyclists also during the side road pedestrian green phase.



**Figure 5.2 Directional cycle signals**  
(Source: AECOM design)

Capabilities on project:  
Transportation



**Figure 5.3 Proposed staging plan diagram for Temple Hill (R113)/Monkstown Road (R119)**  
(Source: AECOM design)

**5.2.2 Requirements**

The only cycle signals permitted by the DTTAS are the cycle signals previously discussed in Section 2.2.3 of this report (three aspect with no directional arrows). These signals only allow all cyclists to stop or proceed and do not include for directional control of cycle movements.

An amendment to the Road Traffic (Signs) Regulations and Road Traffic (Traffic and Parking) Regulations would be required to include for the option to provide directional signals specifically for cyclists. The signal head configuration for directional cycle signals will also need to be included in the Traffic Signs Manual. Guidance regarding the configuration, application and implementation of this solution will also need to be included in the National Cycle Manual. It may be necessary to maintain the requirement for DTTAS approval until this solution initially to ensure it is executed correctly.

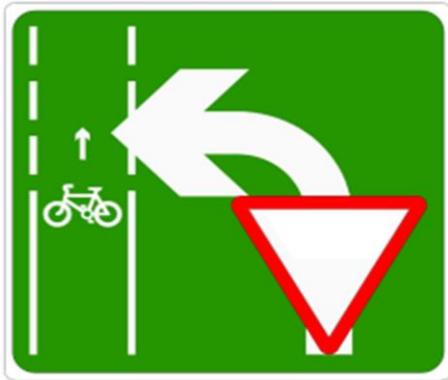
Capabilities on project:  
Transportation

### 5.3 Left Turn (Traffic) Yield Signals/Sign

This is a combination of a flashing amber directional arrow for vehicles turning left at a junction and a warning sign indicating that turning vehicles must yield to cyclists. Cyclists have a green signal at the same time as the flashing amber arrow for vehicles.

A sign, similar to the one shown in Figure 4.13 previously, could be shown on a sign post before the junction to warn drivers that they will need to yield to cyclists at the junction if they are turning. An example of the proposed sign is shown in Figure 5.4. This sign contains images common to existing Irish signs making it easy to understand for all road users.

At the junction, beneath the flashing amber signal head, a yield sign would be placed to clarify the purpose of the flashing amber arrow and remind turning drivers to yield. An example of this proposed configuration is shown in Figure 5.5.



**Figure 5.4 Proposed sign for turning vehicles to yield to cyclists**  
(Source: Preliminary design)



**Figure 5.5 Proposed traffic signal configuration for turning vehicles to yield**  
(Source: AECOM Preliminary design)

#### Advantages

- ✓ Provides warning to vehicles of cyclists to their left
- ✓ Gives cyclists additional confidence that they will be seen at the junction
- ✓ Manages conflict between turning vehicles and cyclists
- ✓ Solution is easy to implement at problem junctions

#### Disadvantages

- ✗ Does not provide any physical barrier to prevent vehicles turning into the cycle lane
- ✗ Sign may be misunderstood by motorists.

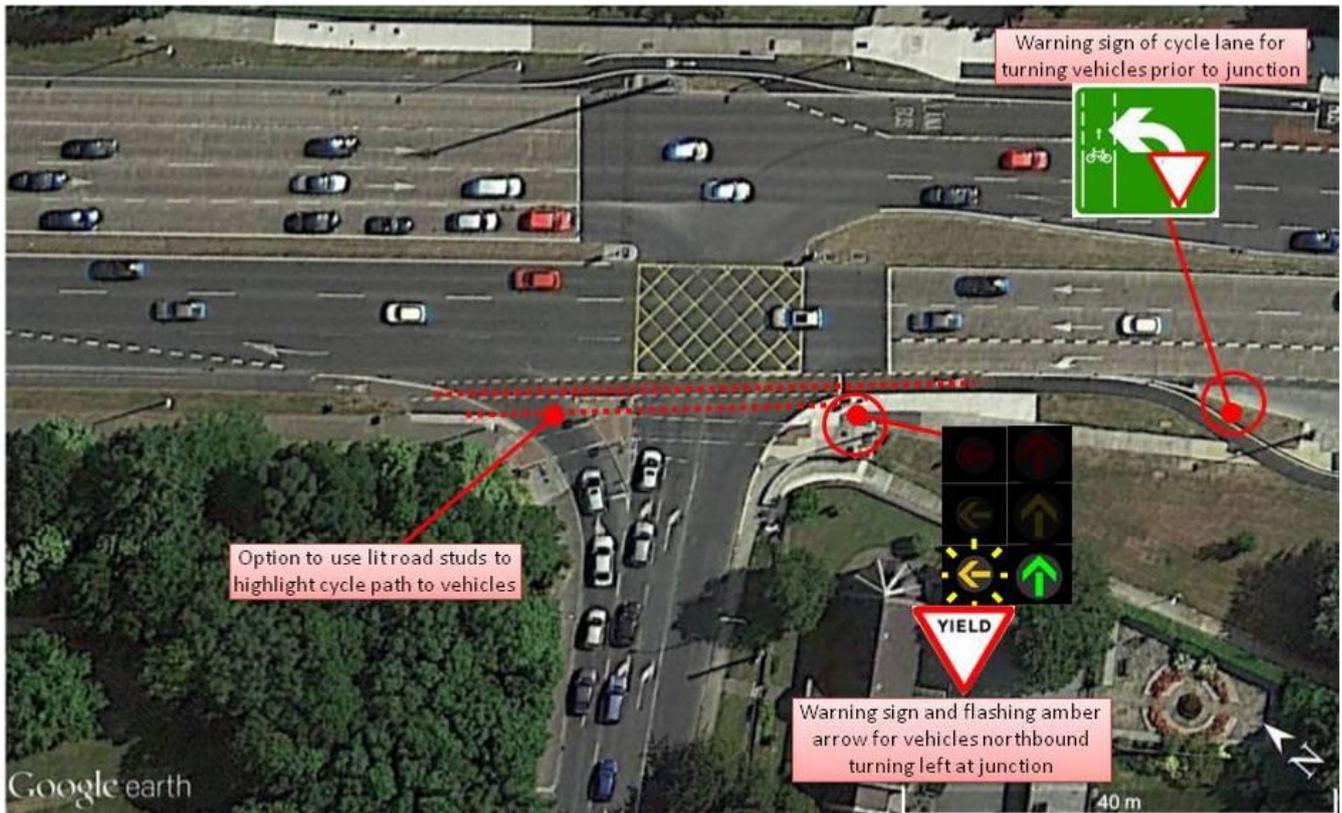
#### 5.3.1 Application

This sign solution could be applied in the following instances:

- At signalised junctions with conflicting turning movements between cyclists and vehicles.
- At priority junctions with conflicting turning movements between cyclists and vehicles.
- At access points to developments, businesses, etc.

An example of how this solution could be implemented is shown in Figure 5.6. It has been applied to the left turn vehicle and straight ahead cyclist conflict problem found at Foster's Avenue/Stillorgan Road (N11), as discussed previously in Section 3.2.1.

Capabilities on project:  
Transportation



**Figure 5.6 Left turning traffic yields to cyclists**

(Source: Google Earth)

In this scenario the existing green left arrow would be changed to a flashing amber arrow. This will indicate to vehicles turning left to take caution when doing so. In addition to this a yield sign indicating that turning vehicles are to yield would be placed beneath the flashing amber signal head. The sign shown in Figure 5.4 would be placed approximately 40m before the junction, to warn vehicles of cyclists to their left and to give way at the junction to cyclists. If additional measures are required there is the option of including lit road studs at the junction to show the path of cyclists proceeding straight ahead.

### 5.3.2 Requirements

To ensure motorists understand how the traffic signals and sign operate together would require extensive consultation, research and trials, as well as a programme of public education if the change were to be implemented nationally. However, the potential benefit for all users justifies exploration of these signal/sign concepts in Ireland.

There is currently no sign in the Traffic Signs Manual that specifically warns turning vehicles of the cyclists to their left. A sign would need to be designed and trialled at appropriate junctions. After an appropriate number of days/weeks of the sign being in place, motorists would be stopped and asked

1. If they saw the sign;
2. What they understood the sign to mean; and
3. If they complied with the sign.

A review of the finding of these interviews would be undertaken and any amendments to the sign content or location would be addressed before a trial of the final design.

The final design would also need to be included in the Road Traffic (Signs) Regulations, Road Traffic (Traffic and Parking) Regulations, the Traffic Signs Manual and the National Cycle Manual. Guidance would also need to be provided regarding the application, design and placement of the sign.

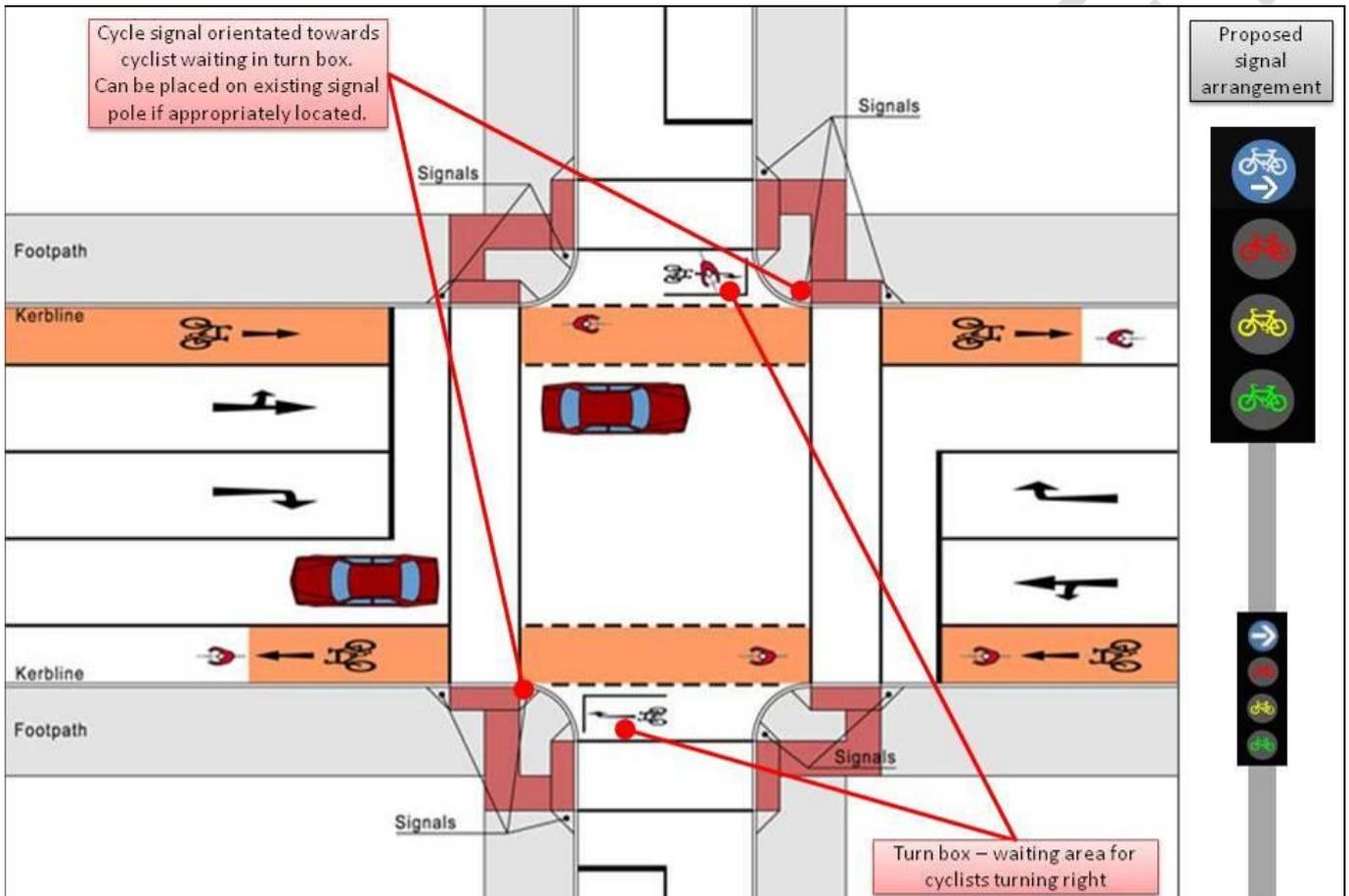
Capabilities on project:  
Transportation

**5.4 Box turn**

Box turns are generally optional in other countries, but in Copenhagen they are legally compulsory and therefore so commonplace that special signals or markings are not always required. However, in most other countries where box turns are used, a combination of signals, signs and/or road markings are used to aid cyclists in completing this manoeuvre.

The National Cycle Manual provides a solution, shown in Figure 5.7, which can be implemented, where there is sufficient space, to create a safer turning procedure for cyclists.

Cyclists stay to the left of the approach, move into a stacking area at the mouth of the side or cross road, and wait for the green phase. This arrangement avoids right turning cyclists having to weave across busy traffic lanes, or getting stuck between opposing streams of traffic in a junction. It also permits straight ahead cyclists to continue along the main road unobstructed.



**Figure 5.7 Box turn or “Stay left to turn right”**  
(Source: National Cycle Manual)

**Advantages**

- ✓ Improves cyclist ability to safely and comfortably make right turns.
- ✓ Provides a formal queuing space for cyclists making a box turn.
- ✓ Manages turning conflicts between cyclists and vehicles.
- ✓ Prevents conflicts arising from cyclists queuing in a cycle lane or on a footway.

**Disadvantages**

- ✗ Higher average signal delay for cyclists, due to the need to receive two separate green signal indications
- ✗ Need to redesign road markings at junction to allow space for turn box/area
- ✗ Additional cyclist specific primary signal required/recommended for cyclists completing stage two of turn.

Capabilities on project:  
Transportation

#### 5.4.1 Application

This solution could be applied in the following instances:

- At signalised junctions.
- Along multiple-lane carriageways.
- Along carriageways with high traffic speeds and/or traffic volumes.
- Where a significant number of cyclists turn right from a left side facility.
- Along cycle track facilities.
- To assist cyclists in navigating safely across tram/light rail tracks.
- Where there is more than one traffic lane in the same direction,
- Where weaving or uncontrolled crossings are unsuitable
- To provide a right hand turn for cyclists at junctions where vehicular traffic is not permitted to turn right.

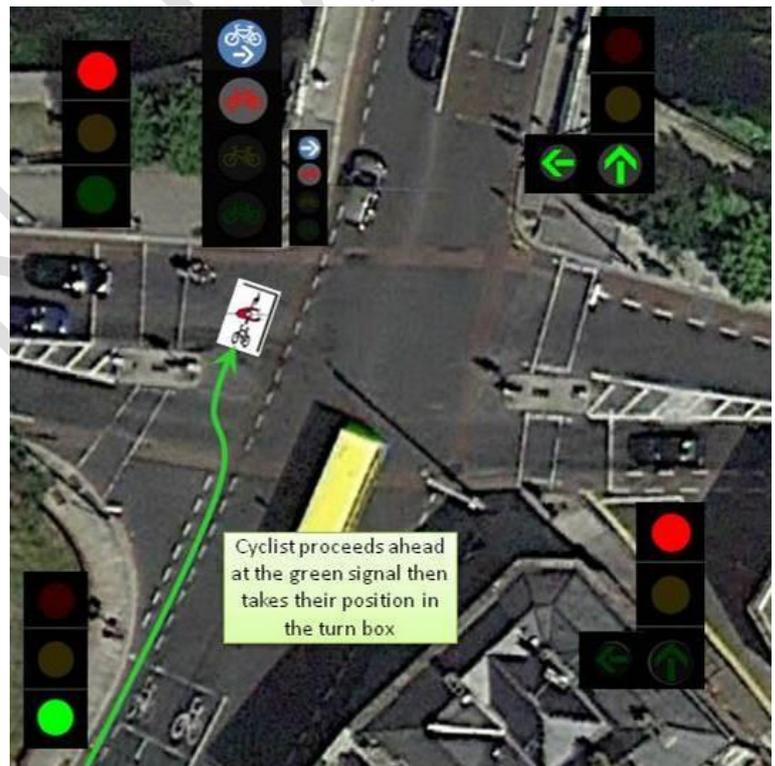
In the UK and Ireland, cyclists are occasionally observed to make box turns informally where they deem this safer.

An example of how this solution could be implemented is shown in Figure 5.8 and 5.9. It has been applied to the right turn cyclist and straight ahead vehicle conflict problem found at Harolds Cross Bridge, as discussed previously in Section 3.3.1.

This solution operates by breaking the right turn for cyclists into two stages.

In stage one, shown in Figure 5.8, the cyclist first proceeds straight ahead with the mainline green signal. The cyclist then moves to the left and enters the designated cycle turn box. The turning box includes a cycle marking and an arrow indicating to cyclists the direction they are to face to complete their right turn. The cyclists turn their bikes through 90° and wait for their green signal.

The turn box is placed in a protected area, usually between the pedestrian crossing and the straight through cycle lane. This gives cyclists the added advantage of being in front of traffic for the next phase.



**Figure 5.8 Box turn-Stage one**

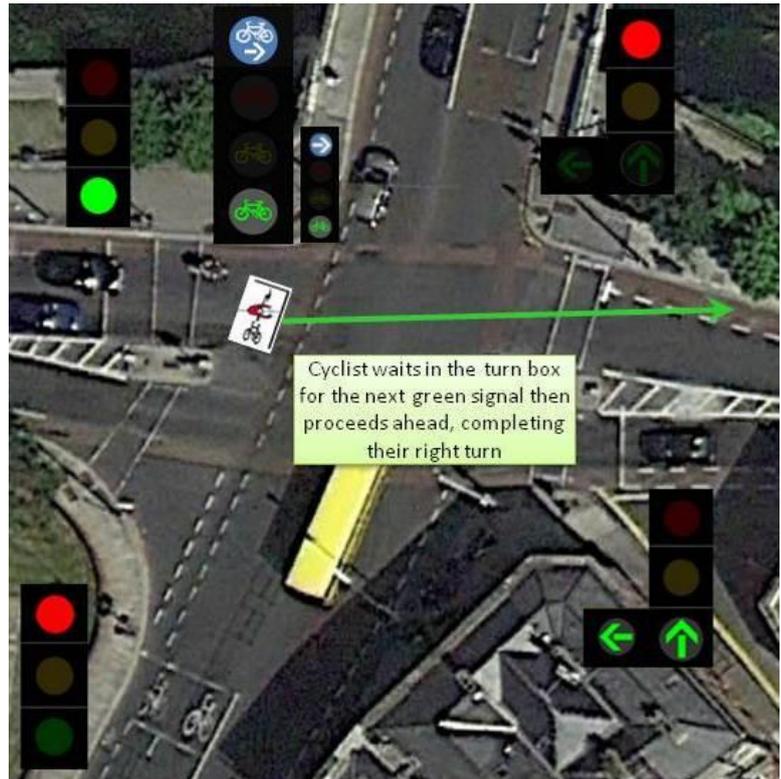
(Source: Google Earth)

Capabilities on project:  
Transportation

This arrangement requires a green signal aspect that the cyclists can see for stage two, otherwise, right turning cyclists do not know when to cross. As the turn box is located beyond the primary traffic signal a cycle signal, orientated towards the turning cyclists, is provided at the turn box (or on a nearby existing signal pole if it is appropriately located). This signal indicates to cyclists when they can proceed.

In stage two, shown in Figure 5.9, the cyclist proceeds straight ahead when they (and the traffic behind them, including other cyclists) get the necessary green signal, completing their right turn.

This arrangement also requires a certain amount of space for cyclists to wait in to turn right. International best practise recommends that the turn box for cyclists should be at least 3m long and 1m wide, depending on the expected volumes of cyclists waiting at any one time to turn right. The width of the box would need to increase if the right turn was heavily utilised by cyclists. To provide the required width the pedestrian crossing and vehicle stop line may need to be moved back from the junction or realigned.



**Figure 5.9 Box turn-Stage two**  
(Source: Google Earth)

(RTA. (2009). *Bicycle Storage Areas and Advanced Bicycle Stop Lines. Technical Direction.*

CROW. (2006). *Record 25: Design Manual for Bicycle Traffic. CROW, The Netherlands.*)

#### 5.4.2 Requirements

This solution is already included in the National Cycle Manual, however, additional guidance is required regarding the application and design of this facility, including the location of cycle signals for turning cyclists.

This solution is currently not allowable on Irish roads as there is no provision for the required road marking and cycle signals in the Road Traffic (Signs) Regulations and Road Traffic (Traffic and Parking) Regulations.

To complete the second stage of this two-stage right turn cyclists are required to wait beyond the primary traffic signal. The control of cycle traffic via the secondary vehicle traffic signal only is not allowed for in current legislation in Ireland. The provision of a primary cycle signal for cyclists waiting in the turn box would be required for this option to be allowable on Irish roads.

Capabilities on project:  
Transportation

## 5.5 Conclusion

| Solution                                 | Amendments/Guidance                                                                                                                                                                                                                      | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cycle Signals</b>                     | <ul style="list-style-type: none"> <li>- Traffic Signs Manual</li> <li>- National Cycle Manual</li> <li>- Guidance Note</li> </ul>                                                                                                       | <p>Appropriate regulations, Road Traffic (Signs) Regulations, Road Traffic (Traffic and Parking) Regulations, are in place for cycle signals but they have yet to be incorporated into the current addition of the DTTAS Traffic Signs Manual. Currently the only cycle signals provided in the TSM are RTS 006 and RTS 007 for use primarily at Toucan Crossings, though these signals can be used at junctions subject to DTTAS approval.</p> <p>Guidance on the application of these signals needs to be included in the National Cycle Manual and a guidance note produced on implementation and design of this solution.</p>                                                                                                                                                                                                                                                                                               |
| <b>Directional Cycle Signals</b>         | <ul style="list-style-type: none"> <li>- Road Traffic (Signs) Regulations</li> <li>- Road Traffic (Traffic and Parking) Regulations</li> <li>- Traffic Signs Manual</li> <li>- National Cycle Manual</li> <li>- Guidance Note</li> </ul> | <p>The only cycle signals allowed by the DTTAS are RTS 006 and RTS 007. These signals only allow all cyclists to stop or proceed across the road and do not include for directional control of cycle movements.</p> <p>An amendment to the Road Traffic (Signs) Regulations and Road Traffic (Traffic and Parking) Regulations would be required to include for the option to provide directional signals specifically for cyclists. The signal head configuration for directional cycle signals will also need to be included in the Traffic Signs Manual. Guidance regarding the configuration, application and implementation of this solution will also need to be included in the National Cycle Manual. It may be necessary to maintain the requirement for DTTAS approval of this solution initially to ensure it is executed correctly.</p>                                                                             |
| <b>Left Turning (Traffic) Yield Sign</b> | <ul style="list-style-type: none"> <li>- Road Traffic (Signs) Regulations</li> <li>- Road Traffic (Traffic and Parking) Regulations</li> <li>- Traffic Signs Manual</li> <li>- National Cycle Manual</li> <li>- Guidance Note</li> </ul> | <p>There is currently no sign in the Traffic Signs Manual that specifically warns turning vehicles of cyclists to their left.</p> <p>The proposed sign would need to be trialed at appropriate junctions. A review of the findings of these trials would need to be undertaken and any amendments to the sign content or location would need to be addressed before a trial of the final design.</p> <p>The final design would need to be included in the Road Traffic (Signs) Regulations, Road Traffic (Traffic and Parking) Regulations, the Traffic Signs Manual and the National Cycle Manual. Guidance would also need to be provided regarding the application, design and placement of the sign.</p>                                                                                                                                                                                                                    |
| <b>Box Turn</b>                          | <ul style="list-style-type: none"> <li>- Road Traffic (Signs) Regulations</li> <li>- Road Traffic (Traffic and Parking) Regulations</li> <li>- Traffic Signs Manual</li> <li>- Guidance Note</li> </ul>                                  | <p>The National Cycle Manual would need to be updated to include the primary cycle traffic signal for cyclists turning right. There would also need to be more detailed information on the appropriate design and implementation of this solution.</p> <p>This solution is currently not allowable on Irish roads as there is no provision for this in the Road Traffic (Signs) Regulations, Road Traffic (Traffic and Parking) Regulations or Traffic Signs Manual.</p> <p>To complete the second stage of this two-stage right turn cyclists are required to wait beyond the primary traffic signal. The control of cycle traffic via the secondary traffic signal only is not allowed for in current legislation in Ireland. The provision of a primary cycle signal to control the movement of cyclists in the turn box waiting to complete this turn would be required for this option to be allowable on Irish roads.</p> |

**Appendices**

WORKING DRAFT

## **Appendix A**

**Road Traffic (Signs) (Amendment) Regulations 2012**

**Road Traffic (Traffic and Parking) (Amendment No.2) Regulations 2012**

WORKING DRAFT