



ACTIVE TRAVEL

Cycle Design Manual

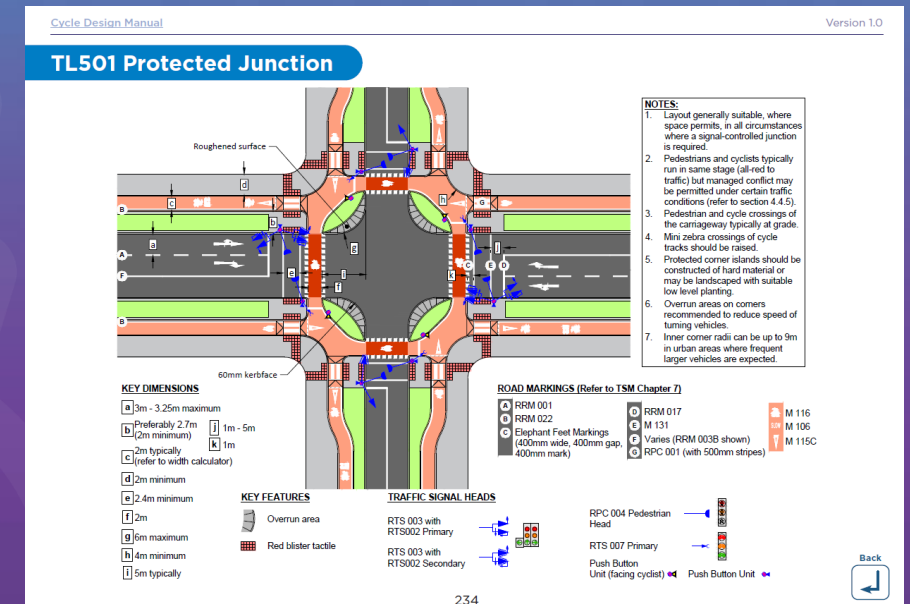
Section 4.4: Signal-controlled Junctions

October 2023



➔ Introduction

- Section 4.4 covers signal-controlled junctions
- Typical Layouts in Appendix (TL 501-509 currently)
- Full junction layouts illustrated, typically simple four-arm junctions
- Layouts will need to be tailored to suit site circumstances
- Designs should be guided by the main requirements for signal-controlled junctions

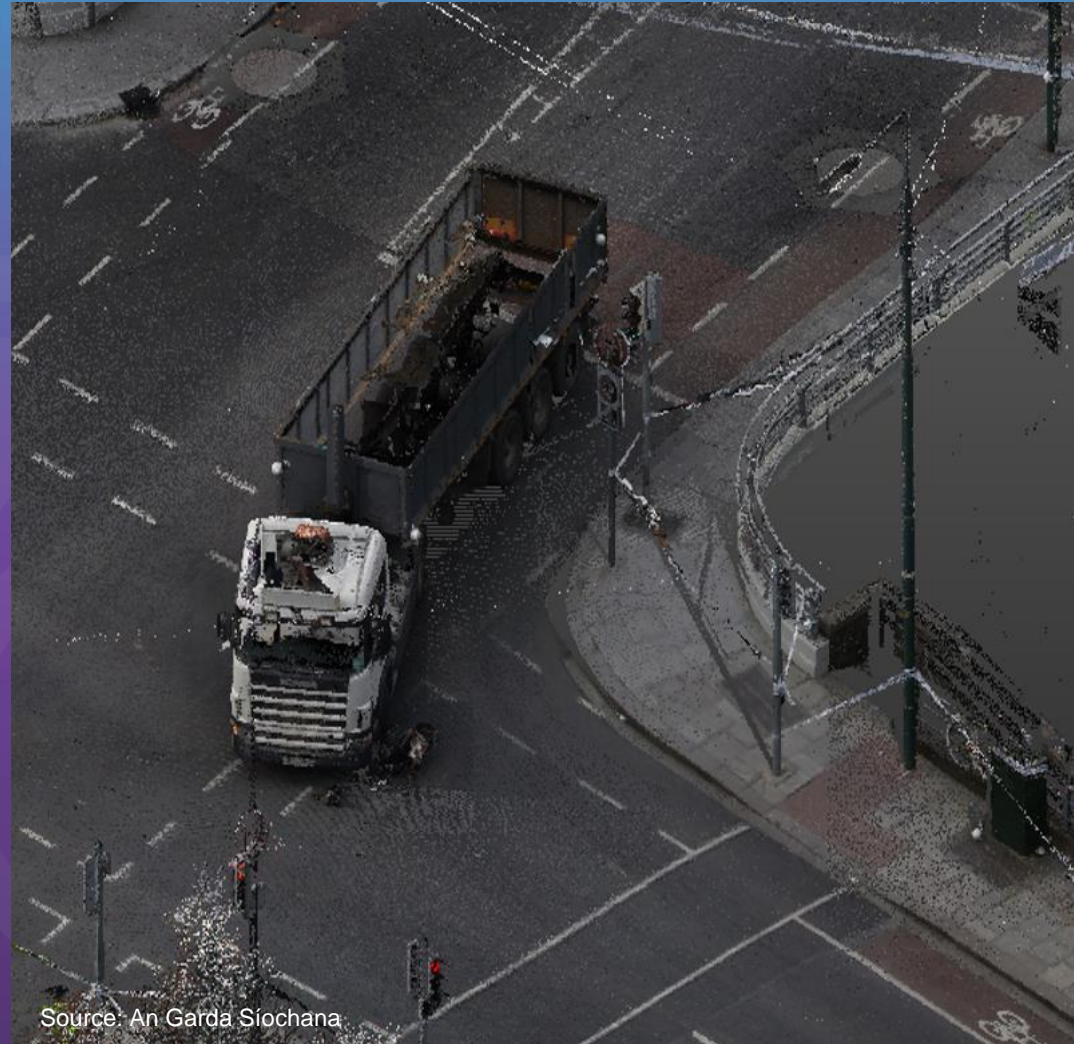


➔ 4.4.2 Main Requirements for signal-controlled junctions

- **Safety**
- **Directness**
- **Coherence**
- **Comfort**

➔ 4.4.2 Main Requirements for signal-controlled junctions

- **Safety**
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Source: An Garda Síochána

Does it FEEL safe?



➔ 4.4.2 Main Requirements for signal-controlled junctions

The way forward?



Adopt a Safe System Approach

...so that the potential for conflict is minimised and that if/when collisions do occur, no one is killed or seriously injured

A Safe System Approach to signal-controlled junction design would include:

- Separating cyclists from motor traffic and pedestrians to greatest extent possible
- Ensuring layouts are legible and forgiving
- Ensuring motor vehicles speeds are slow
- Providing short crossing distances to minimise the potential for conflict with motor vehicles

➔ 4.4.2 Main Requirements for signal-controlled junctions

- Safety
- Directness
- Coherence
- Comfort

Minimising delay:

- ➔ Detection of cycles on the approach and at the junction;
- ➔ Avoiding multi-stage and staggered crossings;
- ➔ Minimising the number of stages and overall cycle time; and
- ➔ Maximising green times for cyclists.

➔ 4.4.2 Main Requirements for signal-controlled junctions

- Safety
- Directness
- **Coherence**
- Comfort

Cycle facilities through signal-controlled junctions should be:

- ➔ Consistent
- ➔ Legible
- ➔ Easily understood by all road users



➔ 4.4.2 Main Requirements for signal-controlled junctions

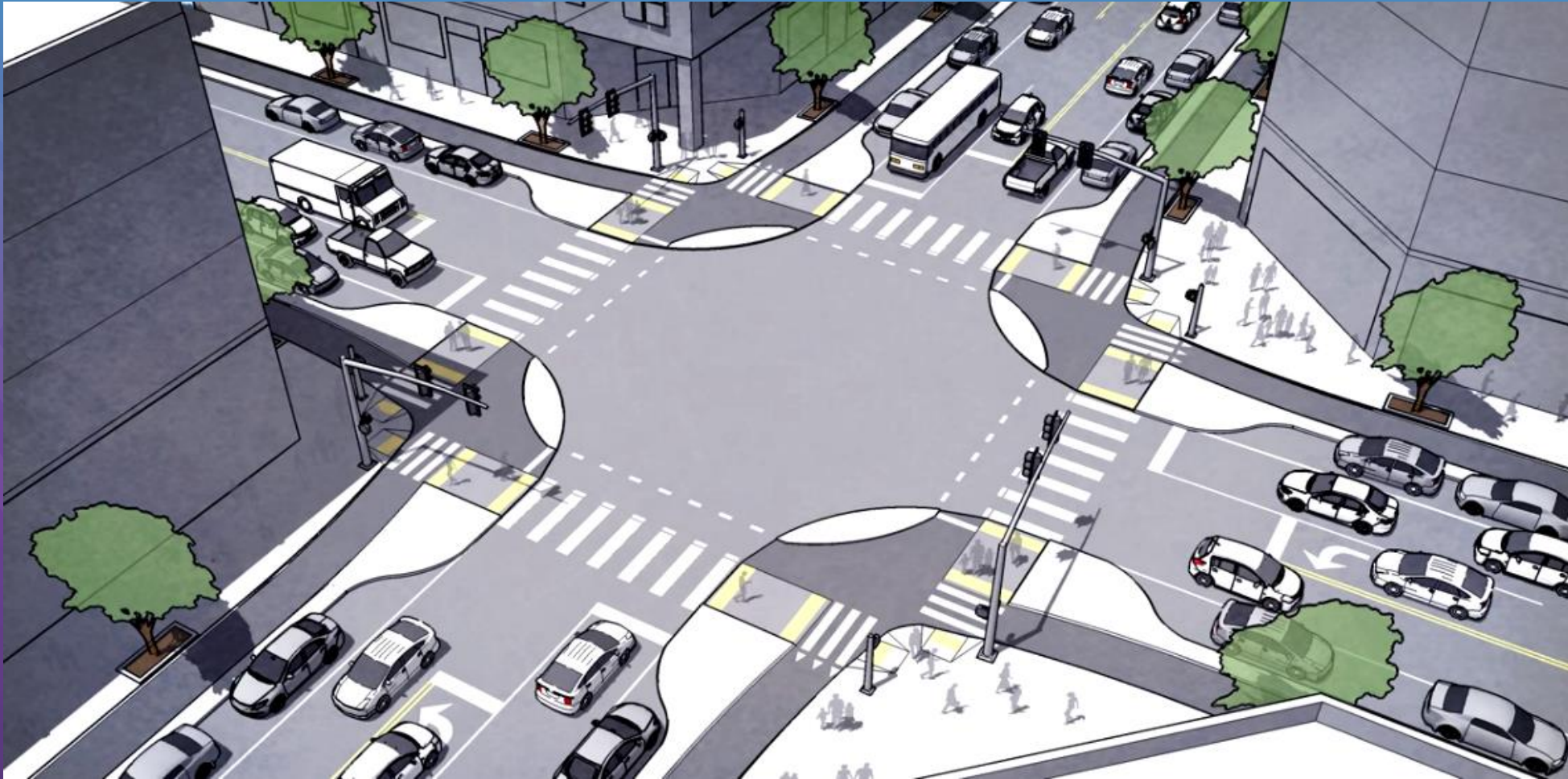
- Safety
- Directness
- Coherence
- Comfort

Key aspects include:

- ➔ Sufficient width
- ➔ Adequate stacking space
- ➔ Smooth surfacing and transitions
- ➔ Additional facilities e.g. footrests



➔ 4.4.3 Protected Junctions



Useful video explaining protected junctions - <http://www.protectedintersection.com/>

➔ 4.4.3 Protected Junctions

What are protected junctions?

Protected junctions are signal-controlled junctions with segregated cycle tracks that provide cyclists with their own space through the junction. Primary aim is to improve cyclists safety (actual and perceived)

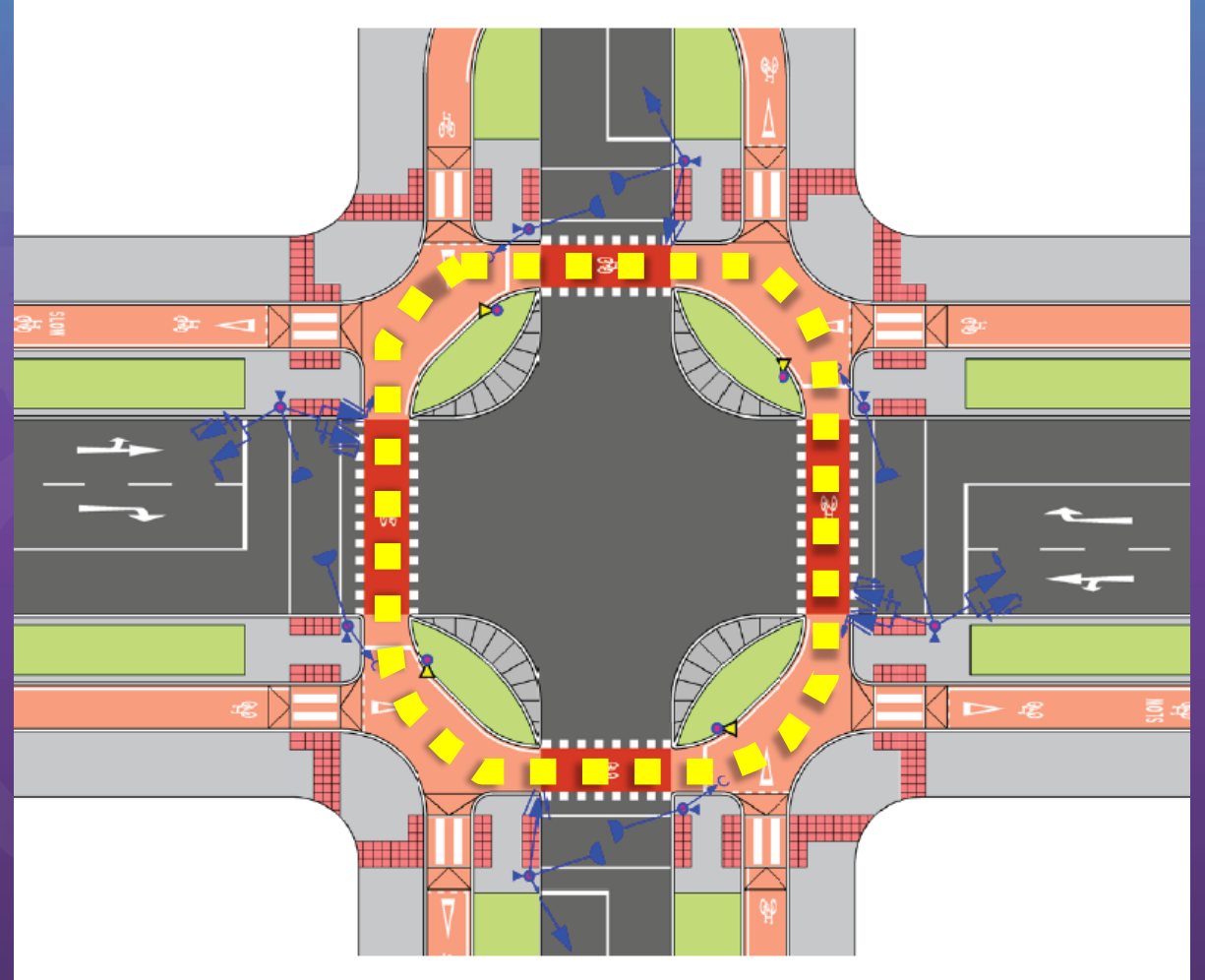
As per CDM Section 4.4.3.1:

In order to provide junction layouts that can safely cater for all cycle movements and are suitable for use by cyclists of all ages and abilities, protected junction layouts are the preferred arrangements for signal-controlled junctions on cycle routes.

→ 4.4.3 Protected Junctions

Key features of protected junctions

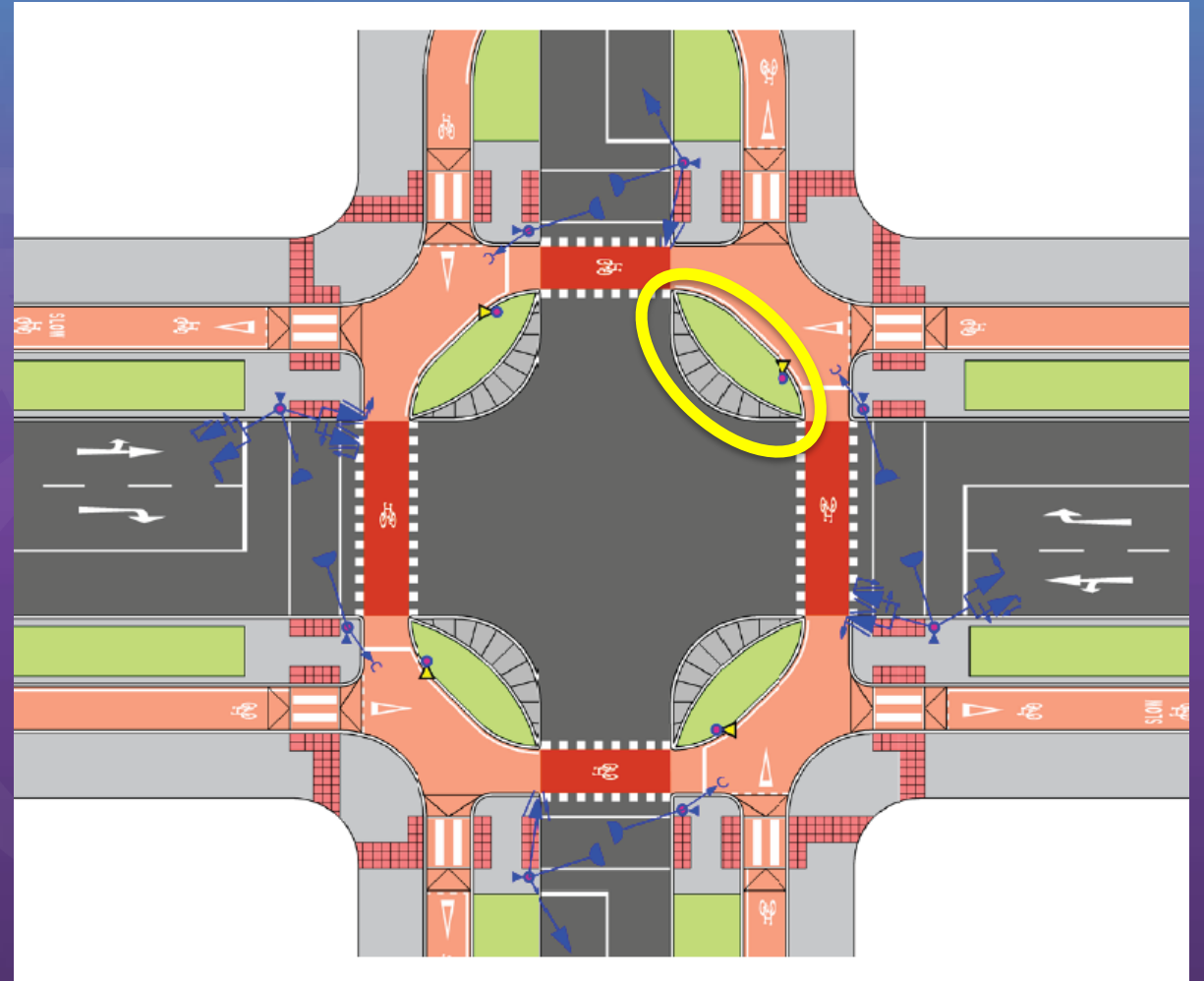
→ Orbital cycle track



→ 4.4.3 Protected Junctions

Key features of protected junctions

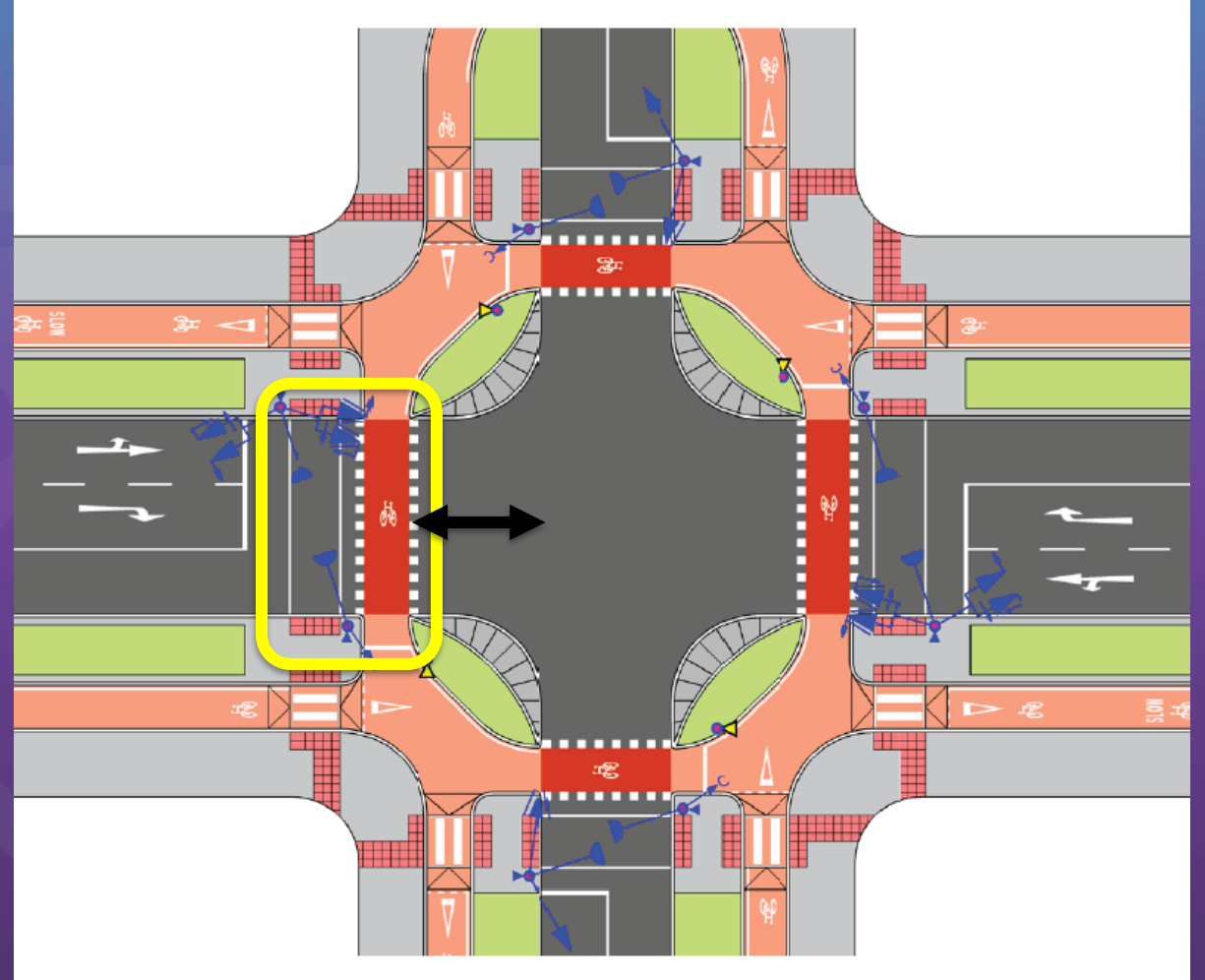
- Orbital cycle track
- Protected corner islands



→ 4.4.3 Protected Junctions

Key features of protected junctions

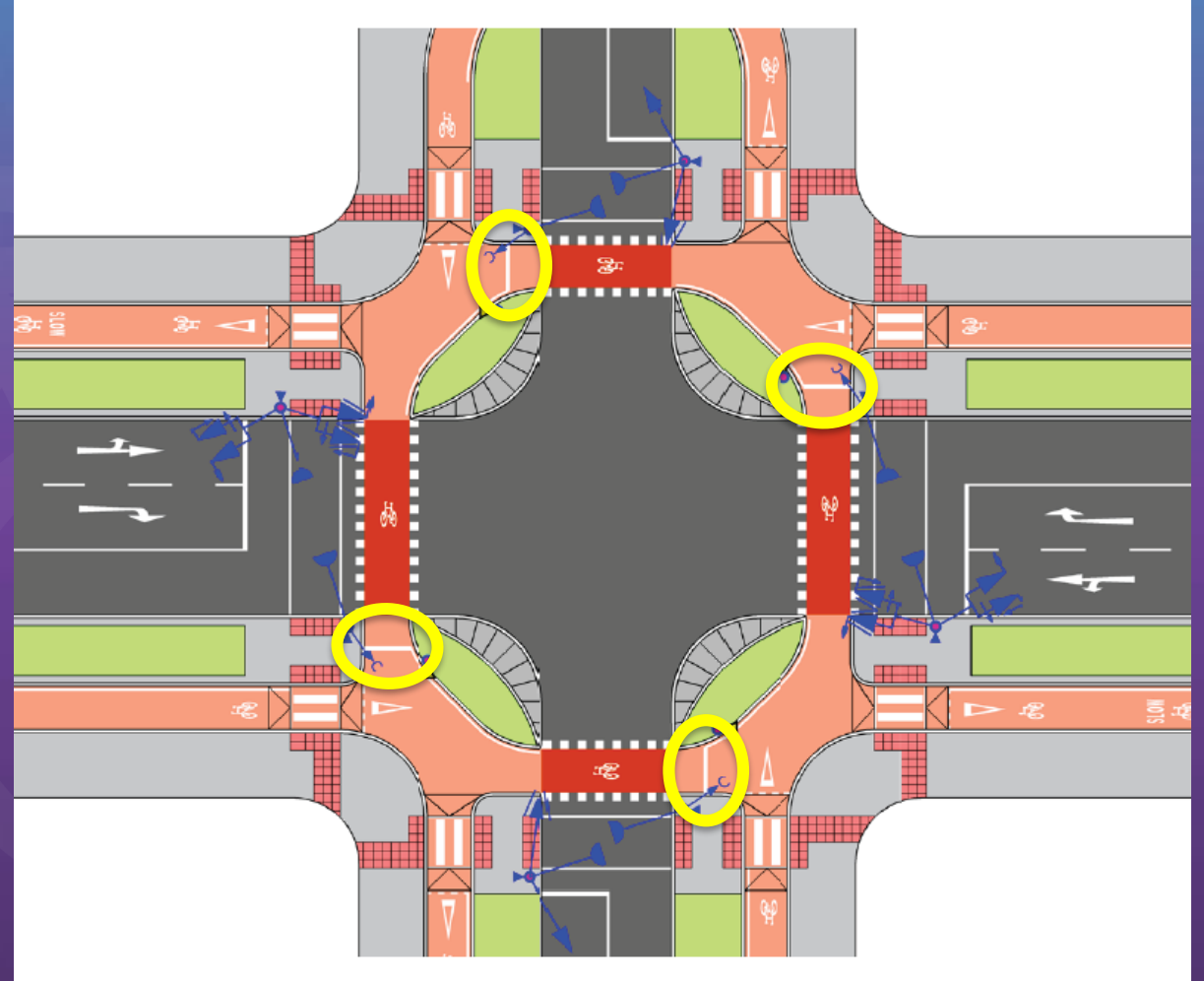
- Orbital cycle track
- Protected corner islands
- Set back parallel crossings



→ 4.4.3 Protected Junctions

Key features of protected junctions

- Orbital cycle track
- Protected corner islands
- Set back parallel crossings
- Forward stop lines for cyclists

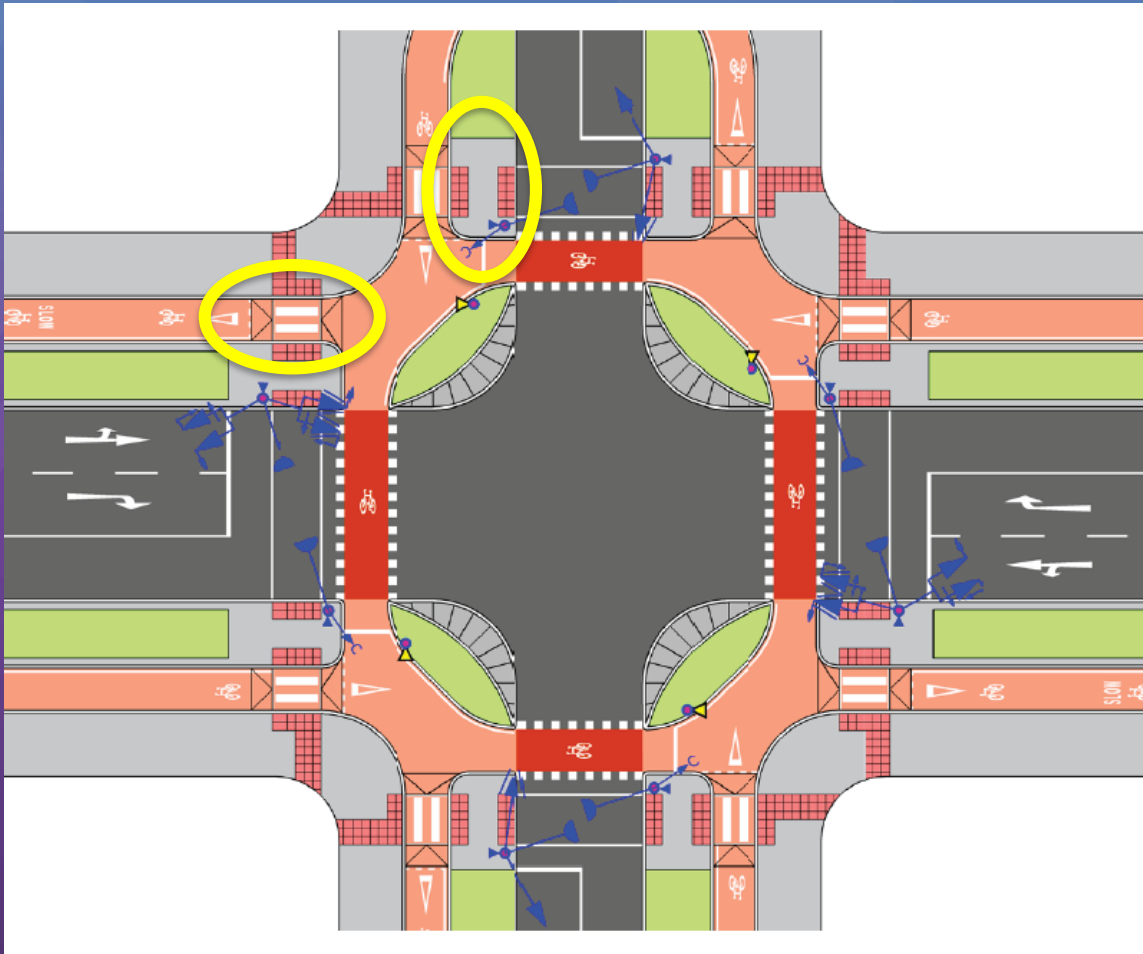


3 TYPES OF PROTECTED JUNCTION LAYOUTS

1. Protected Junction
2. Protected Junction – CYCLOPS Layout
3. Protected Junction with Full Signal Control

➔ 4.4.3 Protected Junctions

1. Protected junction

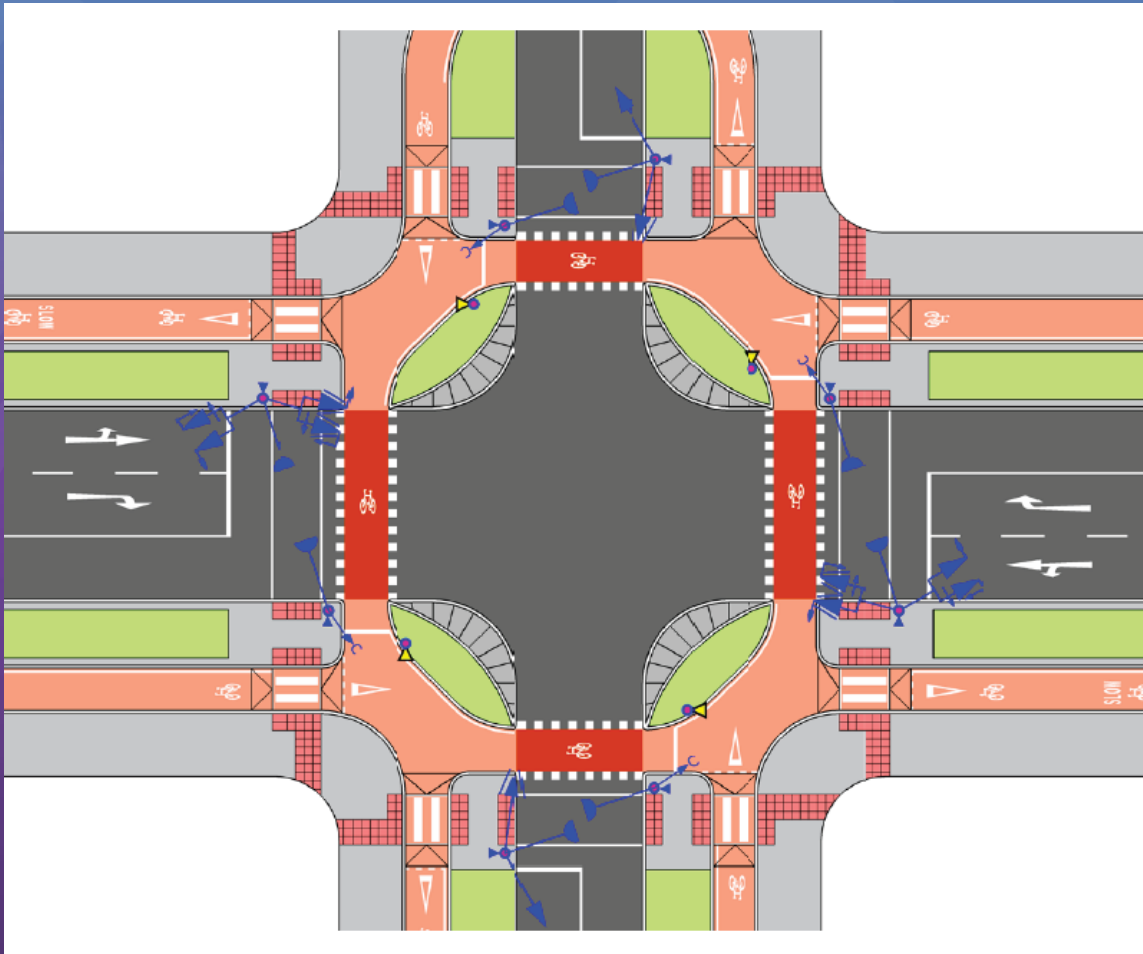


Key additional features:

- ➔ Raised mini zebra crossings
- ➔ Pedestrian landing zones
- ➔ Left turn for cyclists not signal-controlled

➔ 4.4.3 Protected Junctions

1. Protected junction



Potential advantages

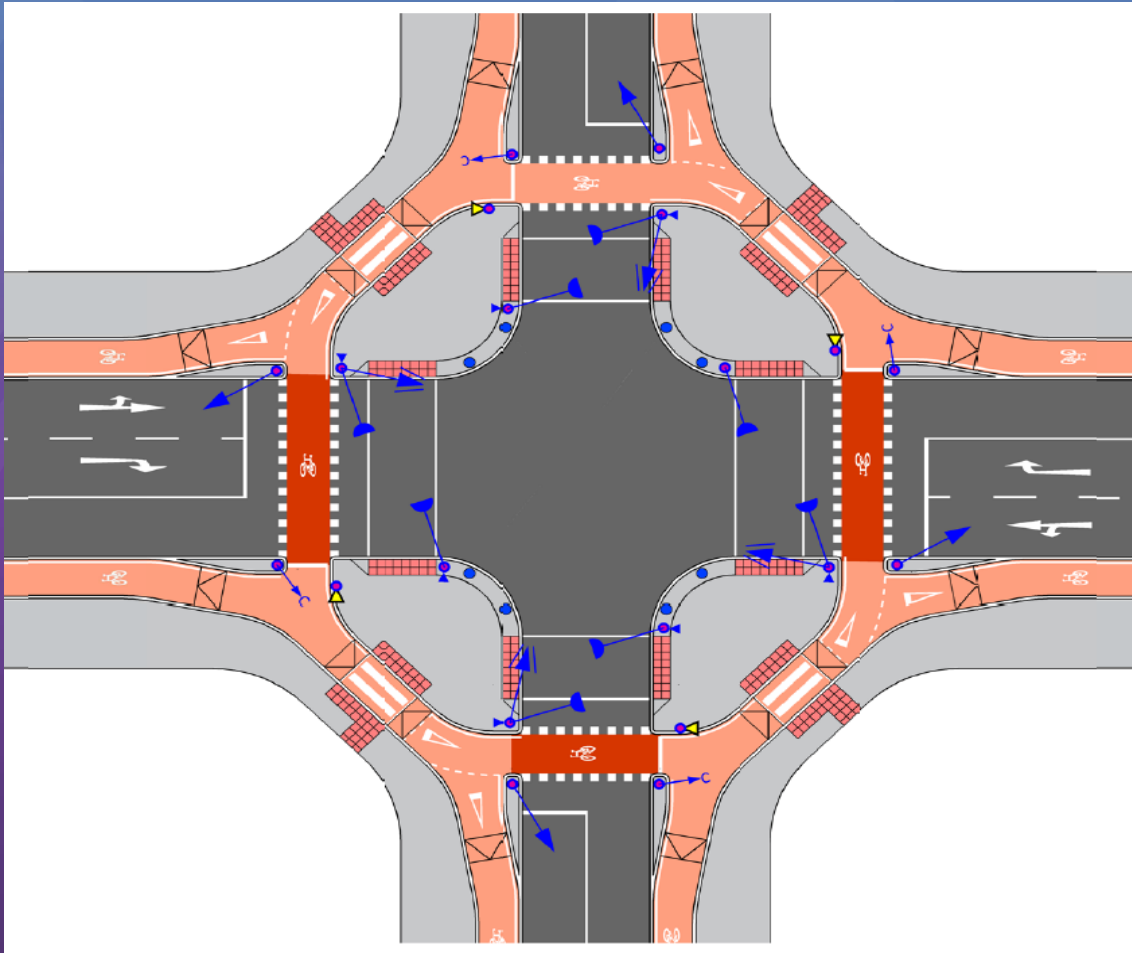
- ➔ Shorter crossing distances of the carriageway for peds/cyclists
- ➔ More stacking space
- ➔ Reduced delays, improved efficiency

Potential disadvantages

- ➔ May require more space than other protected layouts
- ➔ More ramped crossings and locations where cyclists must yield

➔ 4.4.3 Protected Junctions

2. Protected junction – CYCLOPS layout



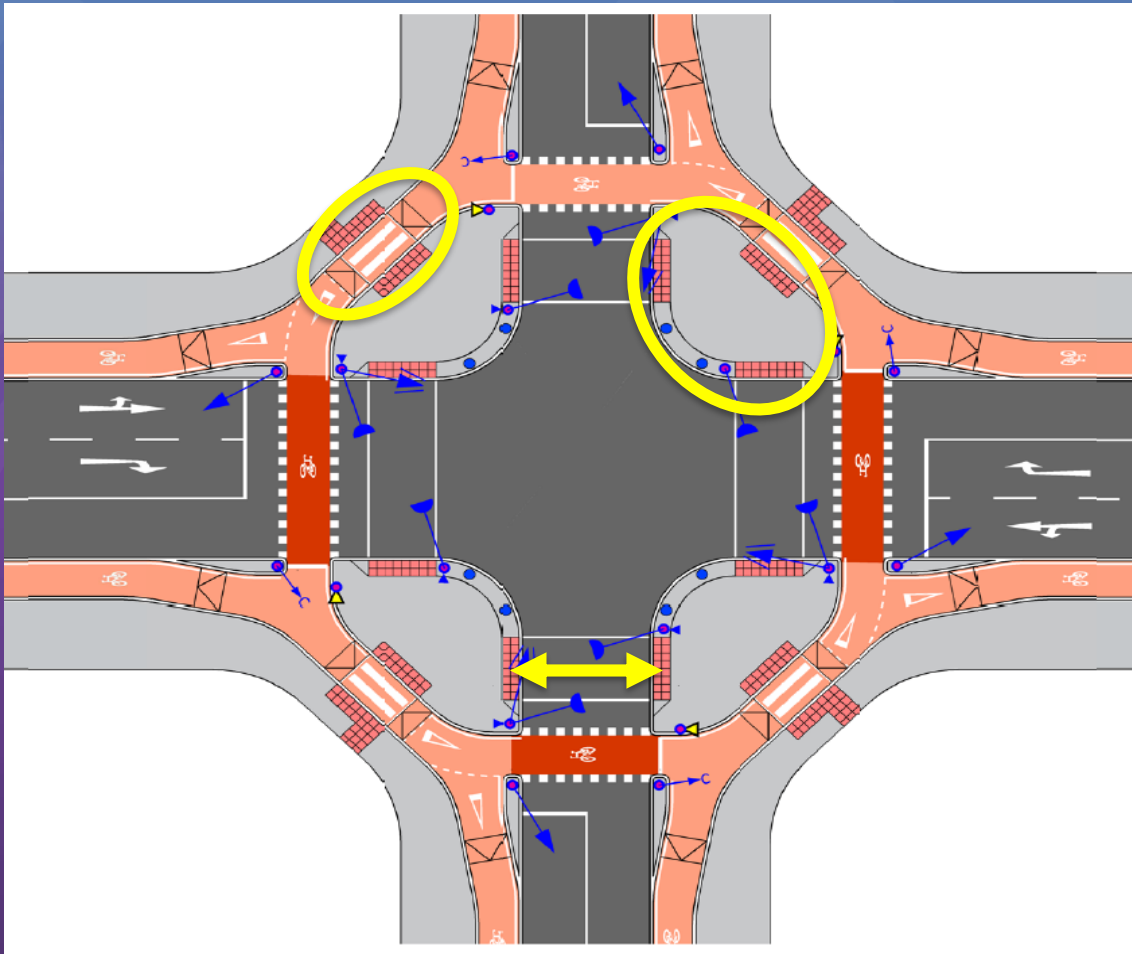
Developed in UK in recent years.

Variation of protected junction layout where cycle track diverts outside the pedestrian crossings.

Pedestrians cross from footpath to corner refuge islands and then cross road on the inside of cyclists

➔ 4.4.3 Protected Junctions

2. Protected junction – CYCLOPS layout

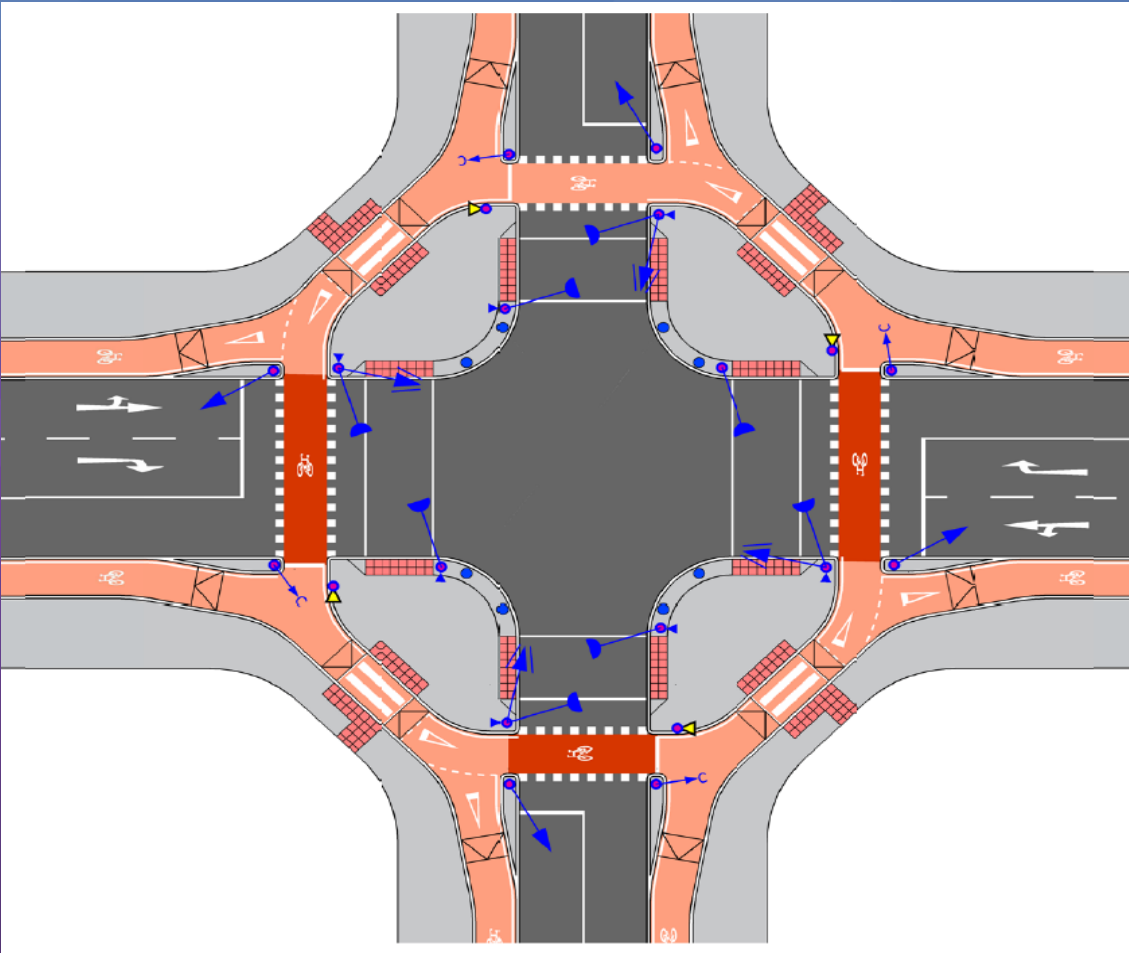


Key additional features:

- ➔ Raised mini zebra crossings
- ➔ Raised corner refuge islands
- ➔ Pedestrian crossings inside the cycle crossings
- ➔ Left turn for cyclists not signal-controlled

➔ 4.4.3 Protected Junctions

2. Protected junction – CYCLOPS layout

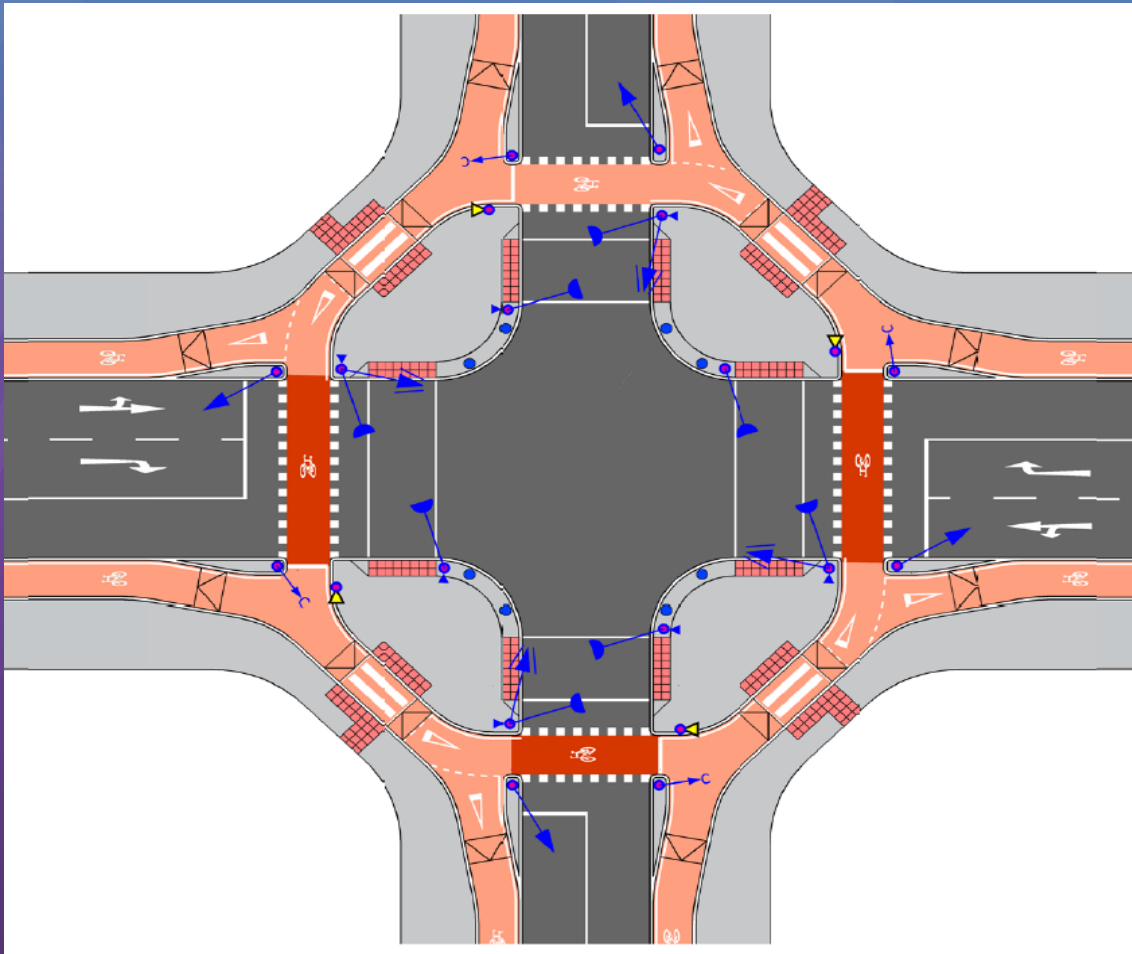


Potential advantages

- ➔ Less zebra crossings for cyclists
- ➔ Opportunity to include diagonal pedestrian crossings
- ➔ More circular cycle track may be comfortable for cycling

➔ 4.4.3 Protected Junctions

2. Protected junction – CYCLOPS layout

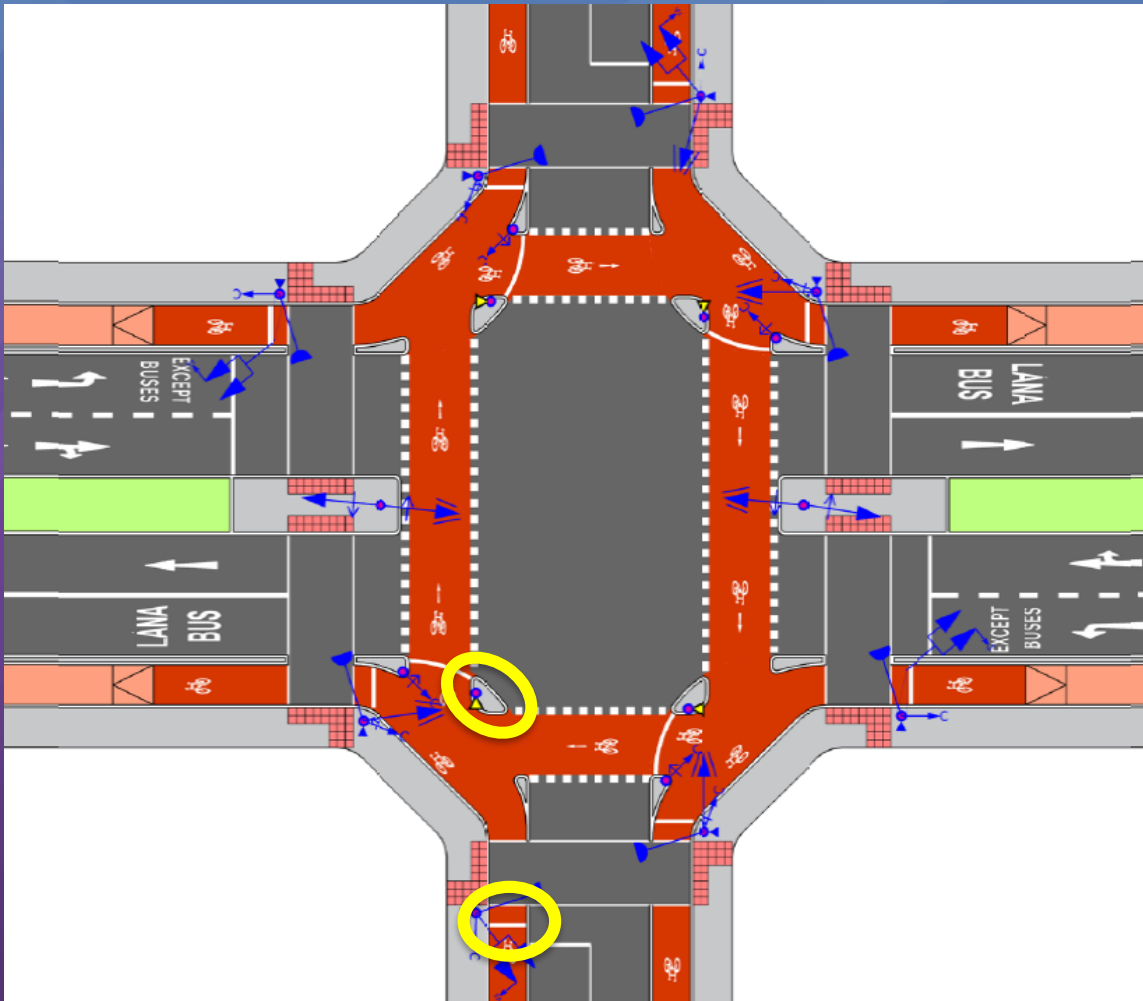


Potential disadvantages

- ➔ Potential for increased interaction between pedestrians and cyclists due to consolidation of zebra crossings
- ➔ Some pedestrians may feel less safe/more isolated on corner islands
- ➔ Slightly longer route for cyclists

➔ 4.4.3 Protected Junctions

3. Protected junction with full signal control

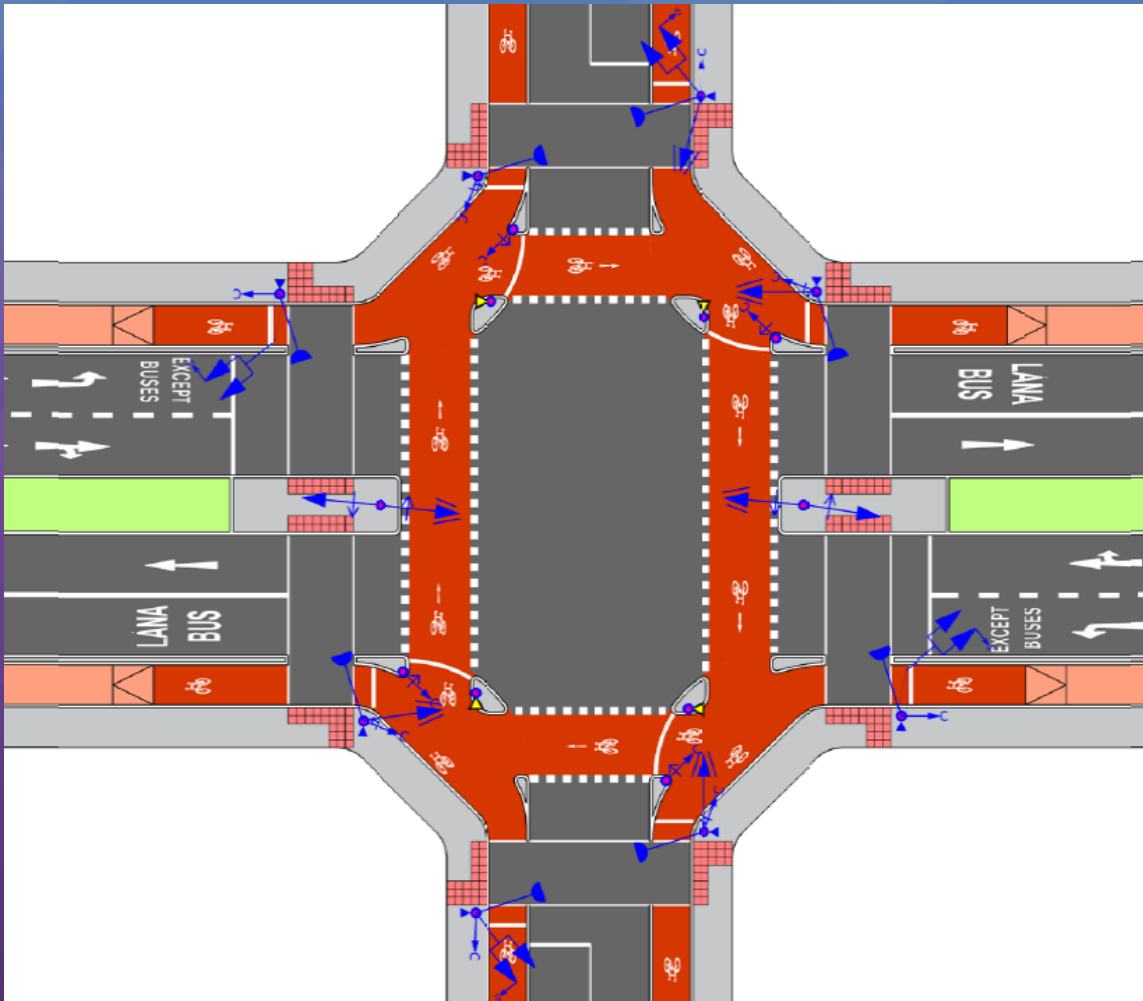


Key additional features:

- ➔ All movements under signal control
- ➔ Additional stop lines for cyclists in advance of the pedestrian crossings
- ➔ Smaller corner islands

➔ 4.4.3 Protected Junctions

3. Protected junction with full signal control

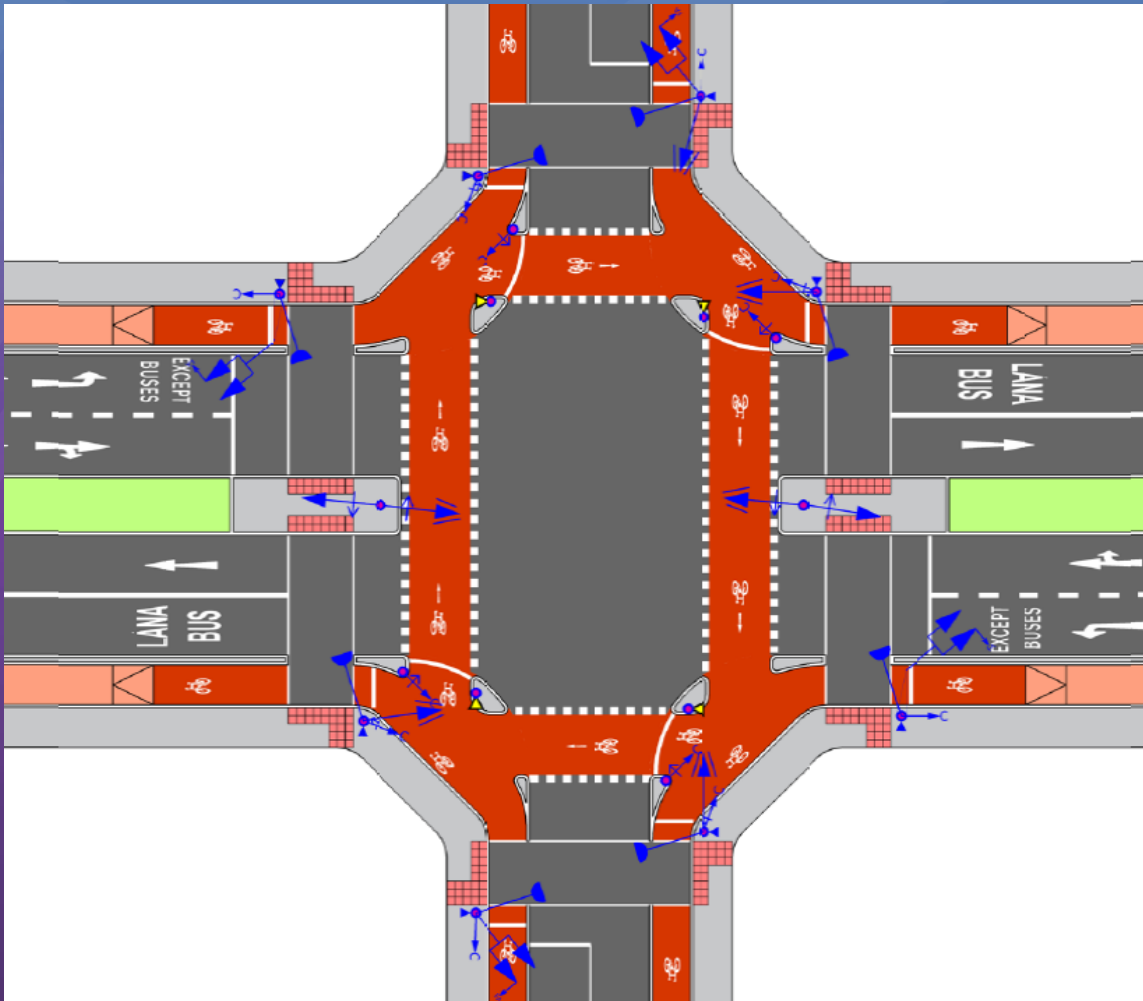


Potential advantages

- ➔ Requires less space to implement
- ➔ Pedestrians may have more controlled priority over cycle track

→ 4.4.3 Protected Junctions

3. Protected junction with full signal control

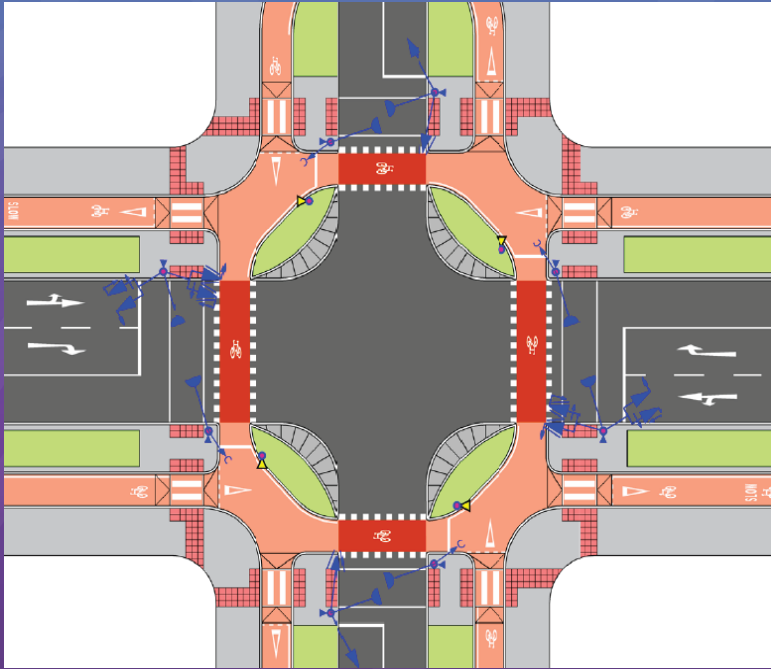


Potential disadvantages

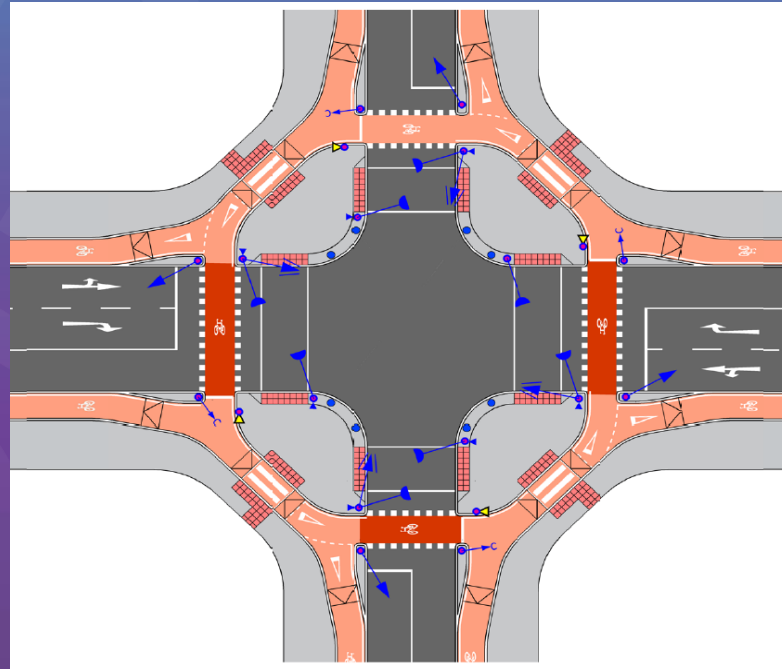
- Longer crossings for pedestrians & cyclists (distance & time)
- Set back crossings more difficult to achieve
- Smaller corners islands may feel less safe
- Sharper turns for cyclists
- Less stacking space likely

➔ 4.4.3 Protected Junctions

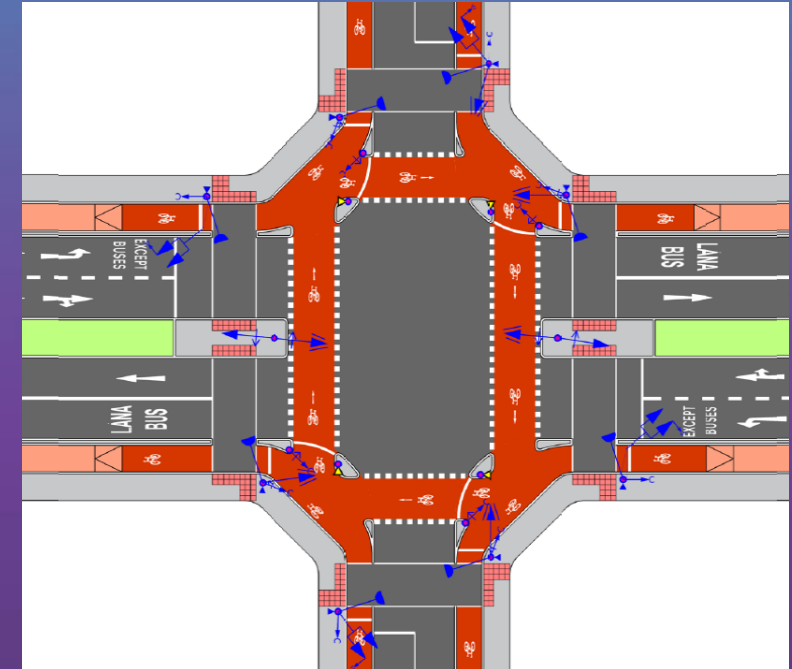
Recap – Three protected junction layouts



Protected junction



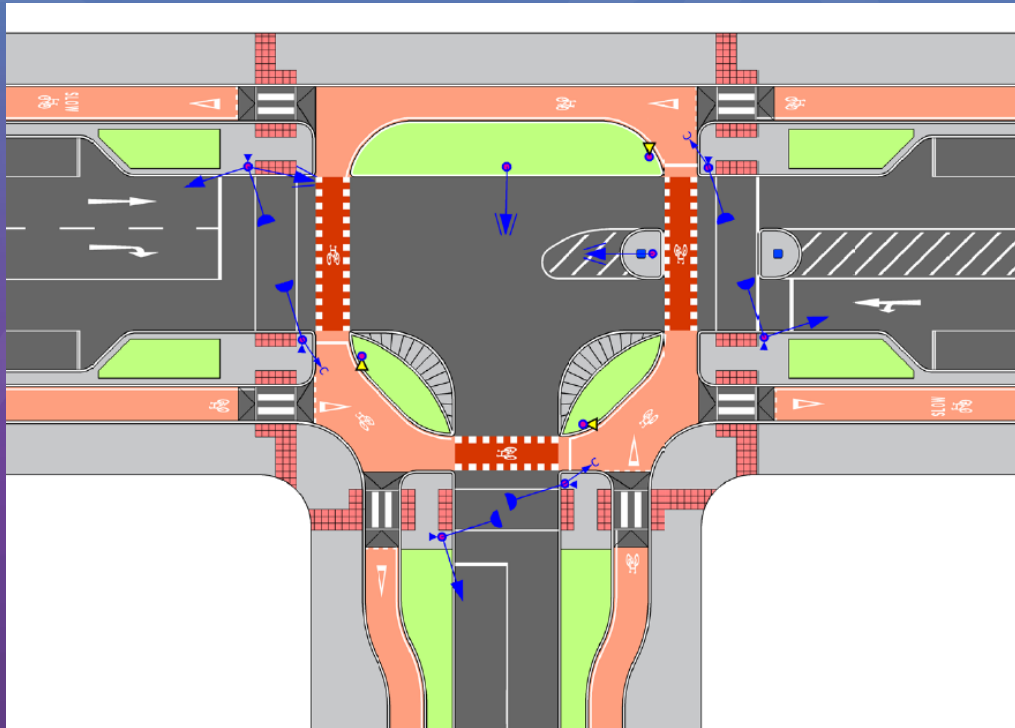
Protected junction –
CYCLOPS layout



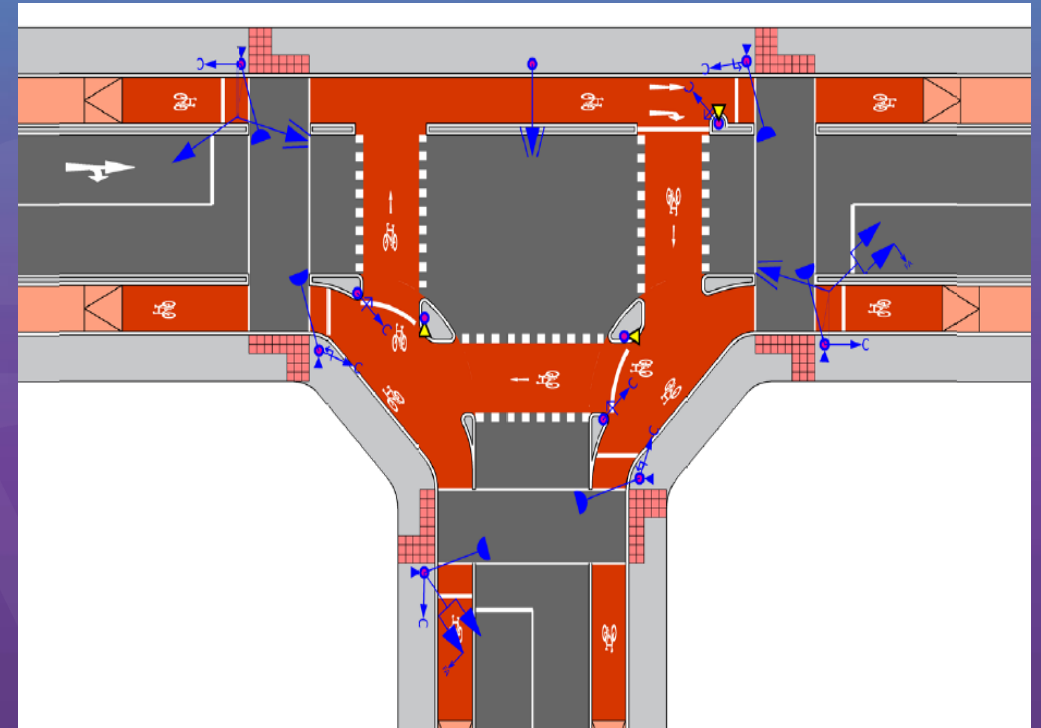
Protected junction
with full signal control

➔ 4.4.3 Protected Junctions

Protected T-junctions



Protected T-Junction



Protected T-Junction with full signal control

Note: CYCLOPS arrangement (not shown) is considered less transferable to a T-Junction layout

➔ 4.4.4 Other signal-controlled junction arrangements

Remember!

In order to provide junction layouts that can safely cater for all cycle movements and are suitable for use by cyclists of all ages and abilities, **protected junction layouts are the preferred arrangements for signal-controlled junctions on cycle routes.**

If a protected layout is not possible/feasible e.g. interim / temporary scheme or in exceptionally constrained environments....



May consider other signal-controlled junction arrangements in section 4.4.4

➔ 4.4.4 Other signal-controlled junction arrangements

- Dedicated cycle phase
- Signal-controlled junction with toucan crossings
- Two-stage right-turns
- Advanced stop lines (ASLs)
- Streaming lanes (legacy junctions only)

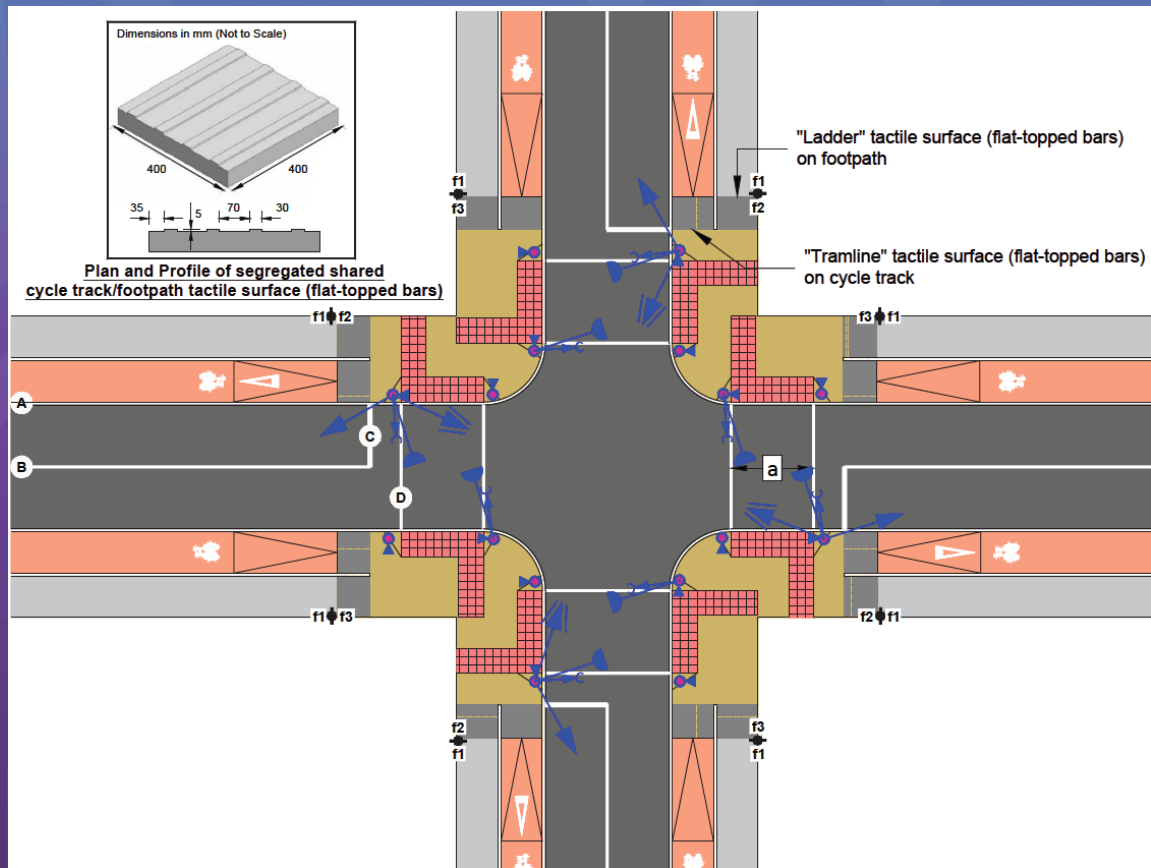
Section 4.4.4.1 of the manual states:

If any layouts in this section are being proposed for use in circumstances outside of the above two scenarios, e.g. new developments or locations that are not heavily constrained, a departure from standards should be sought and approved prior to implementation.



➔ 4.4.4 Other signal-controlled junction arrangements

Signal-controlled junction with Toucan crossings

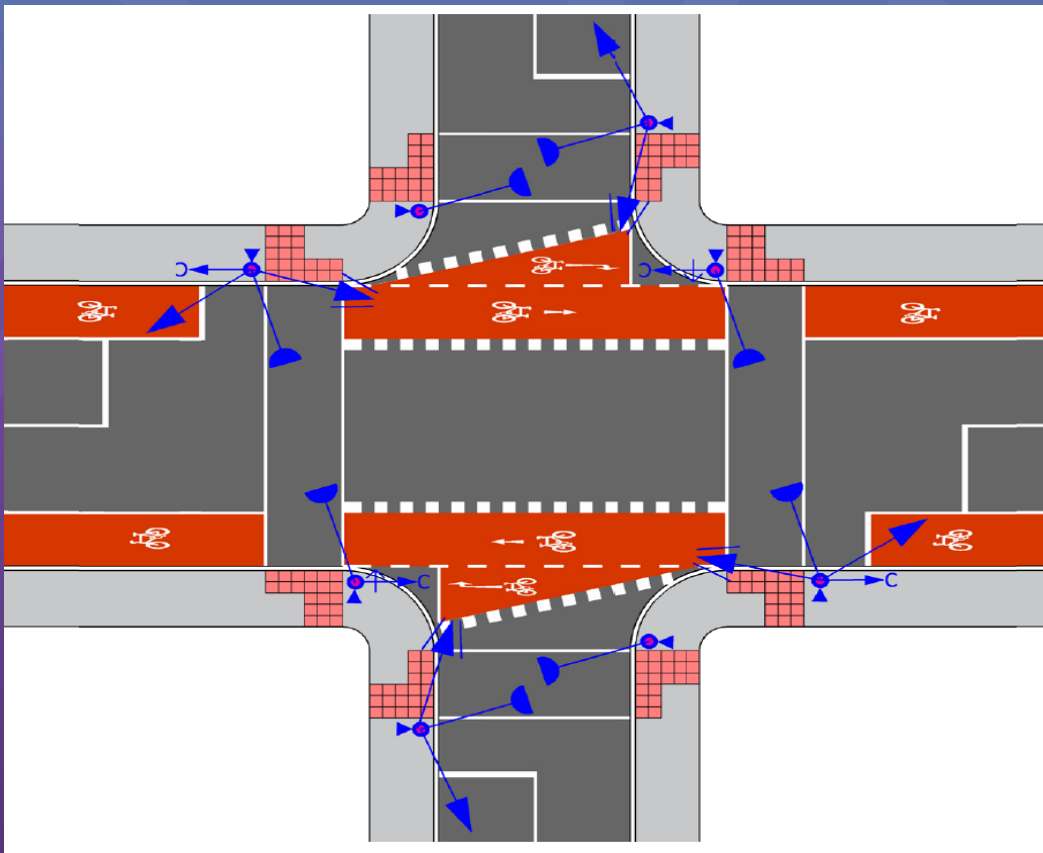


Section 4.4.4.3 states:

As shared facilities are generally disliked by both pedestrians and cyclists, signal-controlled junctions with toucan crossings should only be used in exceptionally constrained environments, as part of interim cycle schemes or where a shared pedestrian and cycle facility exists on the approach roads.

➔ 4.4.4 Other signal-controlled junction arrangements

Two-stage right-turns (replaces previous Box Turn layout)



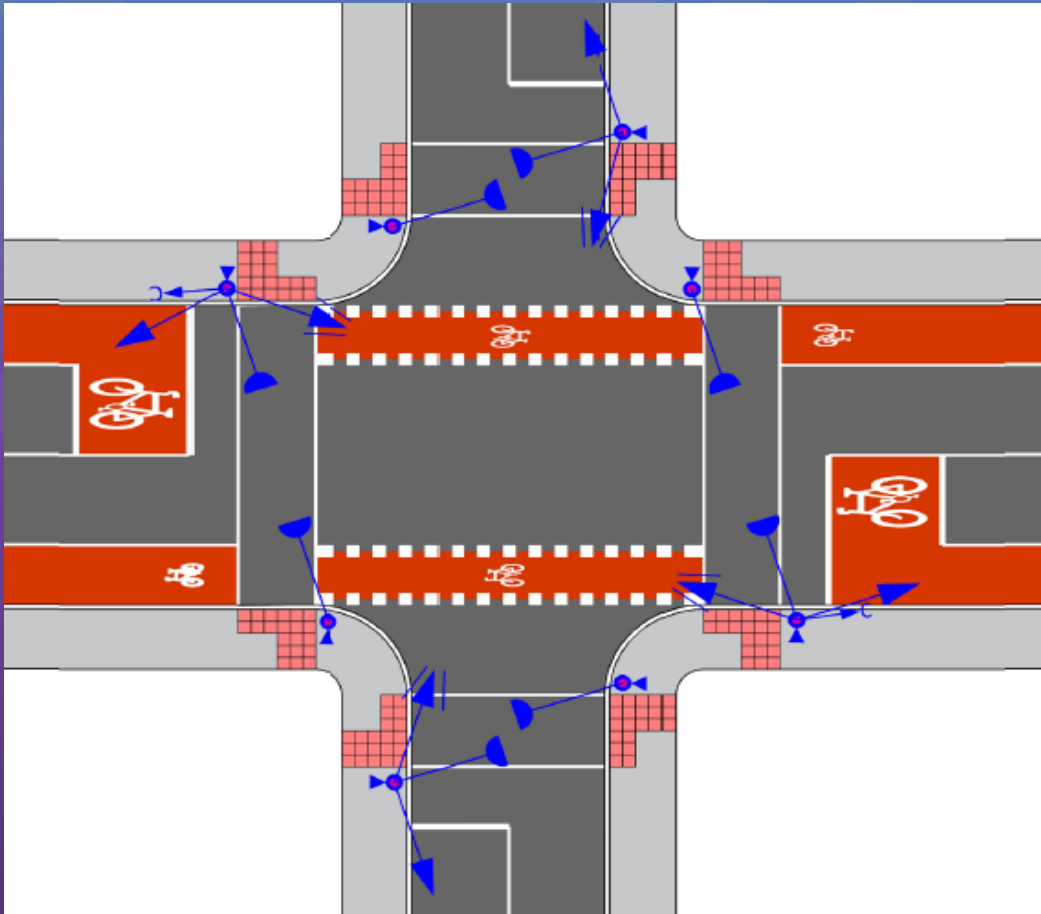
TL 507



Example from Amsterdam

➔ 4.4.4 Other signal-controlled junction arrangements

Advanced Stop Lines (ASLs)



In line with the principles of this manual to provide safe, high-quality cycle facilities for people of all ages and abilities, new ASLs should therefore only be considered in exceptional circumstances and only on junction approaches where the traffic conditions are suitable for a mixed cycling environment as per the criteria specified in Table 2.1. They should also only be provided on single lane approaches. ASLs over multi-lane approaches are not recommended.

ASLs should only be used on single lane approaches – not recommended on multi-lane approaches.

➔ 4.4.4 Other signal-controlled junction arrangements

Streaming Lanes (Legacy junctions only)



Streaming lanes are no longer recommended for use in new scheme designs.

Where streaming lanes currently exist, interim measures may be considered to improve the safety of cyclists pending a permanent solution

➔ 4.4.5 Traffic Signal Operations and Components



4.4.5 Traffic Signal Operations and Components

4.4.5.1 General

Chapter 9 of the Traffic Signs Manual ([TSM](#)), provides details of the requirements for traffic signals for use both at new installations or when replacing equipment at existing locations. The layout, symbols and the circumstances in which each signal may be used are specified. Chapter 9 should be read in conjunction with other relevant chapters of the Traffic Signs Manual.

The following sections presents some guidance on cycle provisions at signal-controlled junctions based on TSM requirements however designers should always refer to TSM for the most up-to-date guidance.

➔ 4.4.5 Traffic Signal Operations and Components

Single aspect low level cycle signal for optional use at zebra crossings of cycle tracks



➔ 4.4.5 Traffic Signal Operations and Components

Location of Push button units (PBUs)



PBUs must be located so that they are accessible to all including those using non-standard cycles.

Must be able to reach the PBU without cycle encroaching onto the carriageway

Recommended that PBUs are located a minimum of 1.5m from the edge of carriageway

PBUs may need to be located on standalone poles as shown opposite

➔ 4.4.5 Traffic Signal Operations and Components

Minimising conflicts with turning motor traffic

Right-turning motor traffic

Right-turning motor traffic and straight-ahead cyclists should, where practicable, always be separately staged in a junction under signal control to eliminate the conflict risk.

Left-turning motor traffic

Preferably, left-turning motor traffic and straight-ahead cyclists will also be separately staged to eliminate the conflict risk.

However, at signal-controlled junctions with lower volumes of left-turning motor traffic, to achieve optimum operational effectiveness including the efficient movement of cyclists, consideration can be given to permitting straight-ahead cyclists and left-turning motor traffic to proceed at the same time in a partial conflict arrangement.

➔ 4.4.5 Traffic Signal Operations and Components

Minimising conflicts with turning motor traffic

Partial conflicts

Table 4.24: Thresholds for partial conflict based on volume of left-turning motor traffic.

Volume of left-turning motor traffic (PCU/Hour)	Partial conflict permitted
0-100	Yes
101-150	Departure required
>150	No

Partial conflicts are strongly discouraged if:

- » The volume of left-turning traffic exceeds 150 PCU/Hour.
- » A two-way cycle track crosses the junction.
- » In rural locations with higher traffic speeds.
- » There is a large volume of HGV's turning left e.g. at a business park or industrial estate.

➔ 4.4.5 Traffic Signal Operations and Components

Minimising conflicts with turning motor traffic

Partial conflicts

Where partial conflicts between left-turning motor traffic and straight-ahead cyclists are being implemented, the following additional features are recommended:

- » An early start (see section 4.4.5.6) for cyclist shall be provided;
- » A flashing amber arrow signal (RTS 004) should be used in place of a full green aspect to warn left-turning motorists;
- » Flashing amber LED studs may be included on the inside of the cycle crossing (see Figure 4.103);
- » Set back stop lines for general traffic; and
- » Supplementary yield markings and signage may be considered.





Thank you for your attention

[Email feedback: cyclemanual@nationaltransport.ie](mailto:cyclemanual@nationaltransport.ie)