

ACTIVE TRAVEL GUIDANCE NOTE

Junction Tightening Schemes



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Document	Version	Author	Checked	Date
NTA/ TD/ AN1	1.2	NF	MA	July 2021

1. Introduction

As part of the Active Travel 2021 Programme, Local Authorities were given an allocation for “Low-Cost Junction Tightening/Pedestrian Crossing Schemes”. The purpose of the allocation is to improve the safety and comfort of vulnerable road users at existing priority junctions and pedestrian crossings in town and villages around the country.

This Advice Note is intended to:

- provide a high-level overview and illustrative examples of the options available to improve existing priority junctions on **urban single carriageway roads/streets with speed limits of 50 km/h or less**; and
- inform priority junction designs in urban areas on other walking and cycling schemes being progressed under the Active Travel Programme.

The note complements specific design guidance in other design manuals including:

- National Cycle Manual (<https://www.cyclemanual.ie/>)
- Design Manual for Urban Roads and Streets (<https://www.dmurs.ie/>)

2. Typical legacy issues at priority junctions

The Design Manual for Urban Roads and Streets (DMURS) proposes pedestrians be given the highest design consideration on urban roads and streets (Ref. DMURS 2.2.2):

“To encourage more sustainable travel patterns and safer streets, designers must place pedestrians at the top of the user hierarchy (see Figure 2.21). Walking is the most sustainable form of transport. Furthermore, all journeys begin and end on foot. By prioritising design for pedestrians first, the number of short journeys taken by car can be reduced and public transport made more accessible. The need for more walkable communities is also an issue of social equity as it is the poorest and most vulnerable in society, including children, the elderly and the disabled for whom car travel is less of an option.”

As junctions are a critical link on any pedestrian route, and represent a significant conflict risk between pedestrians/other vulnerable road users and vehicular traffic, it is important that they are designed and constructed to improve the safety of *pedestrians*, and facilitate their priority in accordance with national sustainable transport policy.

Many priority junctions in our towns and villages have been designed with the intention of facilitating ease of movement for turning vehicular traffic, at the expense of pedestrian convenience. These legacy junctions often feature:

1. large corner radii, facilitating swift vehicular turning movements and,
2. poor pedestrian crossing facilities including:

- large distances across the mouth of the junction,
- pedestrian crossings located away from desire lines, and
- inadequate/non-existent dropped kerbs or tactile paving.

Figures 1 and 2 below show typical examples of such junctions.

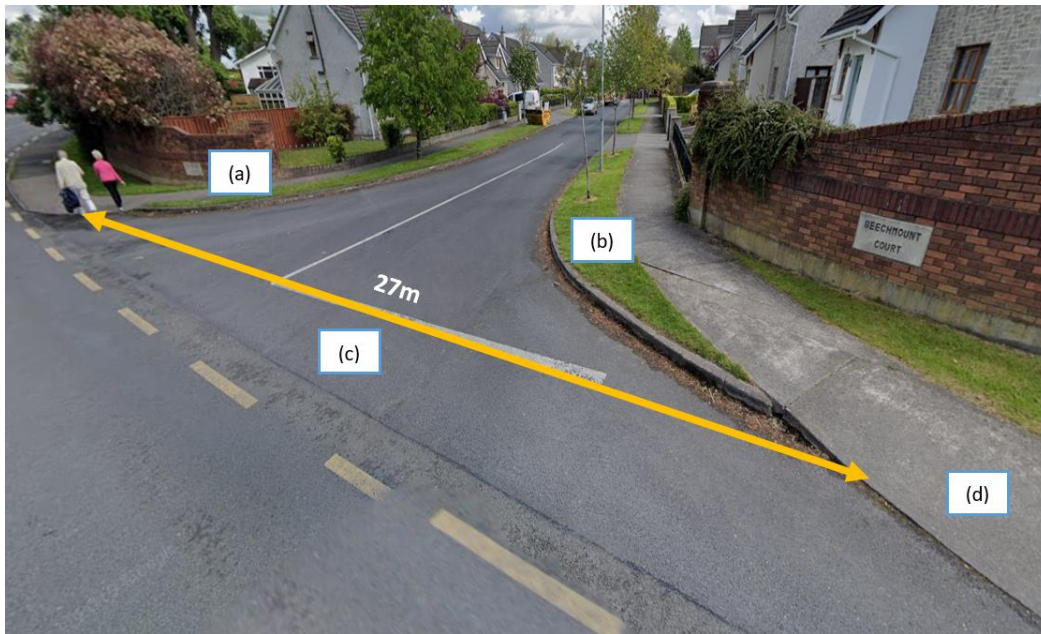


Figure 1: **Typical Design Problems:** (a) & (b) Priority junction with large corner radii, (c) approx. 27m crossing distance and (d) no tactile paving

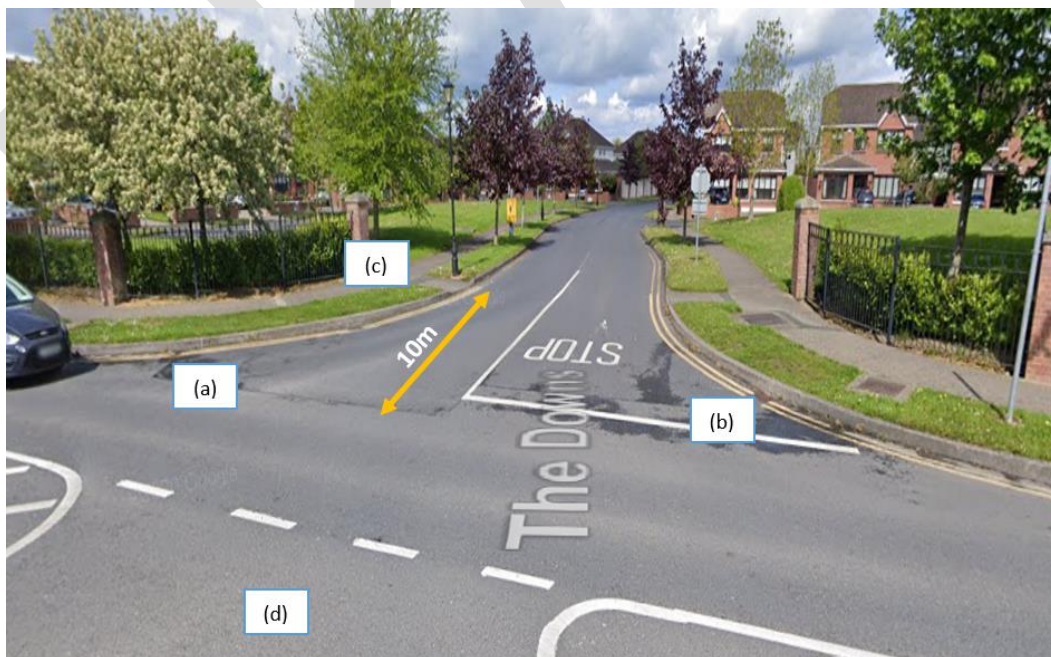


Figure 2: **Typical Design Problems:** (a) & (b) Priority junction with large corner radii, (c) pedestrian crossing located away from pedestrian desire lines and (d) right-turn pocket on main road

3. Measures to improve existing priority junctions

3.1. Key Design Principles

The key Sustainable Safety principles guiding the design of junctions are **Homogeneity** and **Legibility**.

3.1.1 Homogeneity

Junctions are safer when the differential in speed between conflicting road users is minimized.

In effect, turning vehicles (including cyclists / motorcyclists / tractors / trucks) should be taking the turn at a speed range similar to that of bicycles and pedestrians who cross the mouth of the same junction. This should facilitate eye contact between users, and provide sufficient time to avoid collisions.

However, slow turning traffic requires following traffic on the main road to be similarly slow – otherwise the risk of a rear shunt may pressurise the driver to take the turn too quickly.

The Principle of Homogeneity requires that side road junctions are not treated in isolation, but rather, are designed for appropriately low speed turning movements, in the context of an overall low speed environment on both main and side roads.

To introduce safer slow turning junctions, where current traffic speeds are significantly higher on the main road, **consideration should be given to providing complimentary speed reduction / traffic calming measures on the main road.**

Such measures could include, inter alia:

- Lane narrowing to 3m, with hatching of excess area's
- Road carriageway narrowing / footpath widening
- Horizontal Deflections (e.g. build-outs, pinch-points and chicanes)
- Vertical Deflections (e.g. ramps, speed tables and speed cushions)

Detailed guidance on traffic calming measures is available in the Traffic Management Guidelines (available [here](#)).

3.1.2 Legibility

A junction is safer when all road users can read and understand it. A legible junction design will be self-evident, self-explanatory, and self-enforcing.

In the design of side road junctions, in addition to considering pedestrians and cyclists crossing the mouth of the junction, it is just as important to inform vehicles entering / exiting the side road, as well as informing main road traffic approaching the side road junction.

Layout considerations will include:

- Signage and road markings
- Lane markings / colour

- Lighting
- Kerb, verge, drainage and pole details
- Footpath alignment
- Cycle lane / track layout, protection and colour
- Etc.

Note on Local Collector Roads and Higher Order Roads:

Urban roads with a series of central right-hand turning pockets were designed to facilitate through vehicular movement. This type of road (DMURS “link”; National Cycle Manual “Local collector Road”) are likely to have faster traffic speeds, as a result of stacking the right-hand turning vehicles from the moving traffic lanes.

Caution is required in introducing slow tight side road junctions on these roads, as this may introduce mixed messages to the driver – right hand turning traffic is removed, to assist driver progress; yet left hand turning traffic is intended to turn off the main road at a slow speed that would hinder driver progress.

Therefore, the final design of the side road junctions should be consistent with the overall intended speed regime for the main road.

In particular, consideration should be given to the desirability or otherwise of retaining right hand pockets on the main road, and perhaps re-assigning that central stacking space to improved facilities for cyclists, buses or pedestrians at the side of the road.

3.2. Typical Design Interventions

Below are some of a suite of interventions to consider when improving urban priority junctions:

- Minimise corner radii, to reduce vehicle turning speeds and increase inter-visibility between different road users
- Reduce side road kerb-to-kerb crossing distances
- Locate crossings on pedestrian desire lines (i.e. at junction mouth)
- Install raised crossings, build-outs or continuous footways where appropriate, to facilitate pedestrian priority
- Provide adequate crossing widths (minimum 2.4m)
- Provide appropriate tactile paving at crossing points (red tactile solely for controlled junctions)
- Minimise carriageway / traffic lane widths on side roads approaching junctions
- Provide single lane approaches on side roads, for uncontrolled junctions
- Consider installing refuge islands where kerb-to-kerb crossing distances exceed 11m
- Consider treating a number of junctions along a route in a consistent manner, (rather than isolated side road junction improvements), to provide a uniformly tempered main road traffic environment.

3.3. Options available

The four options below can be considered to improve existing priority junctions in urban areas. Each option is described in further detail in the following sections.

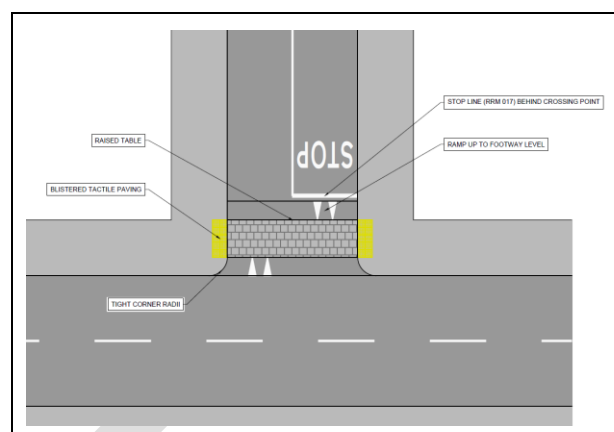
- i. Junction tightening with raised crossing;
- ii. Continuous footpaths (“crossovers”) over very lightly trafficked side streets/entrances;
- iii. Junction tightening with dished crossing; and
- iv. Temporary low-cost junction tightening measures.

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(i) Junction Tightening with Raised Crossing

Tighten the corner radii of a junction and install a raised pedestrian crossing. This junction treatment reduces the speed of turning vehicles, increases inter-visibility between different road users and gives increased pedestrian priority at crossings.

These junctions have been successfully installed in many cities, towns and villages in Ireland in recent years. See examples below.



Typical Layout of Priority Junction with Raised Crossing

Key features	Possible Locations
<ul style="list-style-type: none"> - Tight corner radii (see DMURS / NCM guidance) - Locate crossings on pedestrian desire lines - Minimise the crossing distance, use build-outs if necessary - Single Lane approaches on side roads - Relatively steep ramp to slow turning vehicles, typically 1:5 to 1:10 gradient (1:20 on bus routes) - Tactile paving at both sides of the crossing - Two stage exiting movement for vehicles - Stop line should be located at rear of the ramp - High-quality robust materials (e.g. natural stone, block paving or imprinted asphalt) may be used in urban centres - Bitumenous materials may be suitable outside town/village centres, but consider a contrasting colour to the road surface 	<ul style="list-style-type: none"> - Most priority junctions in urban areas between Regional/Link Roads and Local/Access Roads - Low-medium traffic volumes on side road - Medium-High pedestrian volumes on main road - Where the adjacent traffic lane on the main road is a bus lane or cycle lane
	Other Considerations

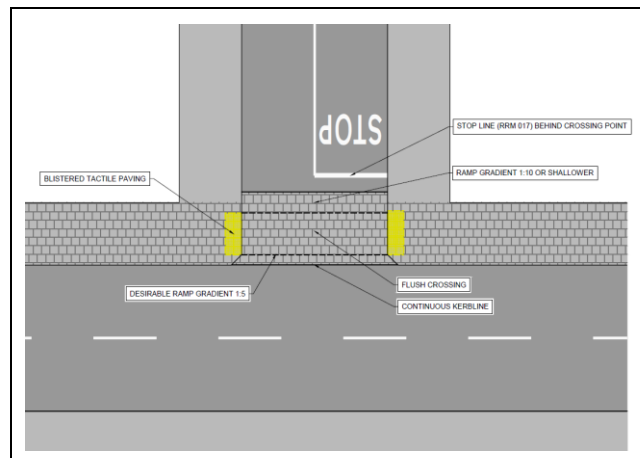
Examples of priority junctions with raised crossings



(ii) Continuous Footpath (“Crossover”)

The footpath construction continues across the side road junction with the footpath height remaining constant, providing a level grade crossing and facilitating pedestrian priority. Short ramps are provided at the front and back of the footpath for vehicular access over the footpath. Vehicles cross the footpath in a two-stage movement to exit the junction.

Continuous footways could be considered in urban areas where there are high pedestrian flows on the main road and low vehicle flows on the side road (e.g. 30-40 vehicular movements in the peak hour).



Typical Layout of a Continuous Footpath

Key features	Possible Locations
<ul style="list-style-type: none"> - Kerbline continues straight across the junction - Footpath height <u>and</u> material remain constant across the junction to provide pedestrian priority - High-quality robust materials (e.g. natural stone, block paving or imprinted concrete) should be used in urban centres - Short steep ramps (typically 1:5) provided at front and rear of footpath for vehicular traffic - Stop line located at rear of the footpath - Side road should have single lane approach - Tactile paving may be required to alert visually impaired persons of the crossing point at busier side streets 	<ul style="list-style-type: none"> - Priority junctions with minor side streets in urban centres - Streets with high pedestrian volumes - Very low traffic flows on side road - Across private entrances e.g. houses, apartment blocks, shopping centres, filling stations, commercial premises, car parks
	Other Considerations

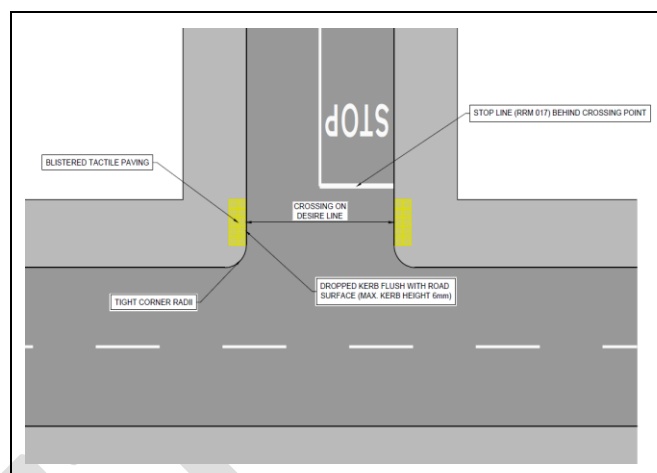
Examples of Priority Junctions with Continuous Footpaths



(iii) Junction Tightening with Dished Crossing

Tighten the corner radii of a junction and provide an uncontrolled crossing point with dished kerbs and tactile paving. This junction treatment reduces the speed of turning vehicles and provides crossing facilities for pedestrians. However, this design does not enhance priority for pedestrians.

Note: Dropped kerbs and tactile paving have been installed at many junction throughout the country in recent years. However in many cases, the corner radii were not tightened sufficiently (or at all) and such junctions can remain hostile environments for pedestrians.



Typical Layout of Priority Junction with Dished Crossing

Key features	Suitable locations
<ul style="list-style-type: none"> - Tight corner radii (see DMURS / NCM for guidance) - Single Lane approach from side roads is preferable - Dropped kerb should be flush with road: if residual kerb is required (for drainage runoff reasons), 6mm max. height of kerb at crossing point - Tactile (buff) paving installed at dropped kerbs - Crossings located on desire lines - Exit stop line should be located behind the crossing point - Consider build-outs to reduce crossing distances - Consider installing refuge islands where crossing distances exceed 10m 	<ul style="list-style-type: none"> - Priority junction between two roads with high traffic volumes (but low speeds) - Moderate traffic volumes on side road - Low pedestrian volumes on main road
	Other Considerations

Examples of priority junctions with tight corner radii and dished crossings

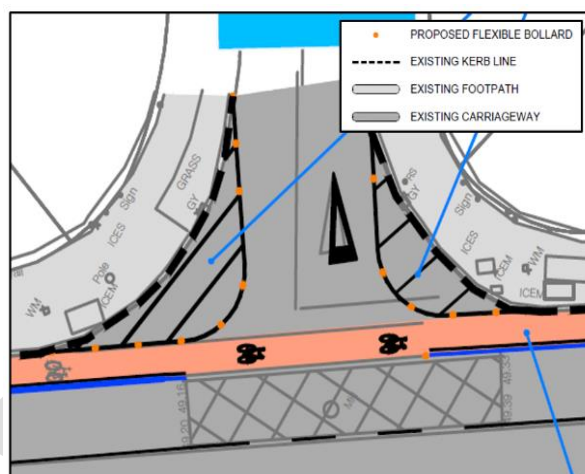


(iv) Temporary Junction Tightening Measures

Priority junctions in urban areas can also be improved in a temporary/low-cost way by use of road markings and various light segregation devices e.g. bollards or planters. This low-cost approach can be used to quickly achieve many of the benefits of the permanent options discussed above e.g. reducing the speed of turning vehicles and shortening crossing distances.

Consideration of pedestrian crossing facilities should be considered at the junction mouth, if none currently exist.

Temporary junction improvement measures have been installed on a number of schemes in the Dublin Region recently to improve the comfort and safety of pedestrians and cyclists during the Covid-19 pandemic. Temporary measures can be upgraded to permanent junction redesigns subsequently.



Typical Layout of Temporary Junction Tightening Measures

Key features	Suitable locations
<ul style="list-style-type: none"> - Fewer civil works required - Tight corner radii delineated via road markings, with associated bollards/planters - Gaps in bollards to correspond with existing crossing point - Single Lane approach from side roads is preferable - Stop line should be located behind the crossing point 	<ul style="list-style-type: none"> - Most priority junctions in suburban areas along low speed roads and streets - Side roads with Low-Medium traffic volumes - Streets with low-medium pedestrian volumes
	<p>Other Considerations</p> <ul style="list-style-type: none"> - Ensure dropped kerbs and tactile paving are provided at existing crossing points - Consider complementary traffic calming measures on main road - Prohibit parking in vicinity of junctions - Maintain adequate sightlines (ensure bollards/planters do not obstruct visibility) - Maintenance of bollards/planters - Monitor junction performance by all users, especially in peak times, and in darkness

Examples of Temporary Junction Improvement Measures



3.4. Options Matrix

Based on the guidance above regarding potentially suitable locations for each junction treatment option, the Options Matrix below can be used as a guide to assist Local Authorities with the selection of the a treatment option based on the volumes of pedestrians using the crossing and the traffic characteristics at the junction.

Priority Junctions Options Matrix

Volume of Pedestrians crossing side road	Traffic Volume on Side Road	Traffic Speed on Main Road		
		Low	← →	High
High	High ↕ Low	Light Green	Light Blue	Light Orange
		Light Green	Light Blue	Light Blue
		Light Green	Light Green	Light Green
Moderate	High ↕ Low	Light Blue	Light Orange	Light Orange
		Light Green	Light Blue	Light Blue
		Light Green	Light Green	Light Blue
Low	High ↕ Low	Light Orange	Light Orange	Light Orange
		Light Blue	Light Orange	Light Orange
		Light Green	Light Blue	Light Orange

Light Green	Consider Continuous Footpath
Light Blue	Consider Raised Crossing
Light Orange	Consider Dished crossing

4. Cycle facilities

Where cycle lanes/tracks cross priority junctions, there are a number of options available to incorporate them safely into side road junction designs. However, detailed consideration needs to be given to ensure junction designs are appropriate for the cycling regime, and meet the needs of cyclists.

Guidance on the design of side road junctions is currently available in the National Cycle Manual (<https://www.cyclemanual.ie/manual/designing/4-9-side-roads-or-t-junctions/>). Some typical examples of priority junctions with cycle facilities are shown below.

Local Authorities that are considering designing priority junctions with cycle facilities should contact the NTA Transport Development team for further guidance on such junction designs.

Note: The National Cycle Manual is currently under-going a review and a revised version is due to be published later in 2021. The NTA will provide training for all local authorities on the revised manual when published.

Appendix A – Extracts from National Policy/Guidance

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The use of tight corner radii and raised pedestrian crossings at priority junctions are supported in a number of National policy/guidance documents including those listed below.

National Policy/Guidance Document	Reference to junction tightening/raised crossings
Smarter Travel	Action 16 includes “creating level grade crossings for pedestrians across junctions”
Design Manual for Urban Roads & Streets (DMURS)	<p>Section 4.3.3 Corner Radii – Reducing corner radii will significantly improve pedestrian and cyclist safety at junctions by lowering the speed at which vehicles can turn corners and by increasing inter-visibility between users.</p> <p>Section 4.4.7 – Raised tables, or platforms, may be placed strategically throughout a network to promote lower design speeds, slow turning vehicles at junctions and enable pedestrians to cross the street at grade. Key locations where these should be considered include:</p> <ul style="list-style-type: none"> • At entrance treatments where Local streets meet Arterial and Link streets
National Cycle Manual	<p>Curve Radii – A small or ‘tight’ radius will reduce the speed of turning traffic and oblige the vehicle to “turn” at a tight angle rather than “veer” or “sweep” into the side road.</p> <p>4.9.1.1 Tight Kerb Radii – Where cyclists share the road space, either in a mixed street environment or with cycle lanes, a tight kerb radius of 1.0m to 3.0m at the mouth of side streets restricts the speed of turning vehicles. Where side roads have cycle tracks, it is important to ensure the cycle track radius is at least 5.0m to ensure cyclists do not swing out into the path of turning vehicular traffic.</p>
BusConnects Preliminary Design Guidance Booklet	Section 8.1 – Raised entry treatments are the preferred arrangement for priority junctions

DMURS Figure 4.42 & 4.43

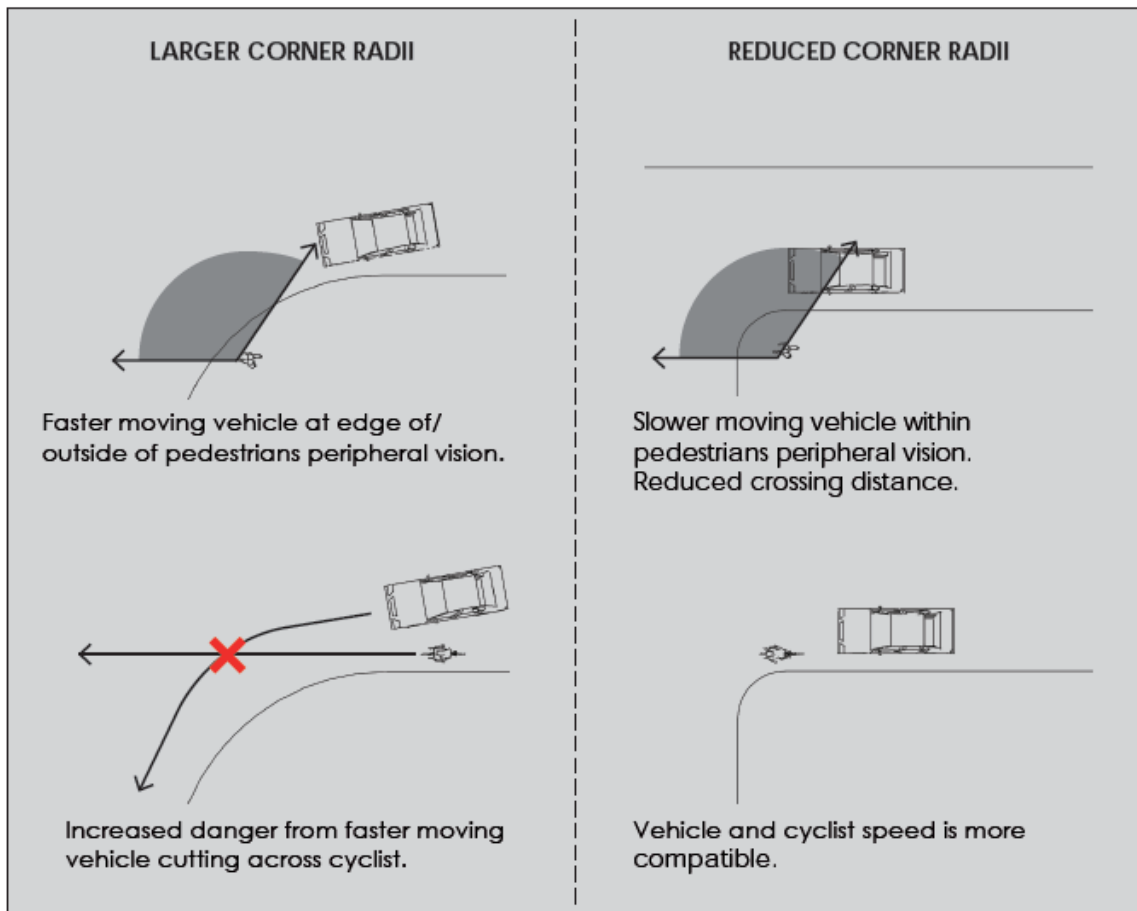


Figure 4.42: Illustration of the benefits of reduced corner radii on pedestrian and cyclist safety (images based on Figures 6.3 and 6.15 of the UK Manual for Streets (2007)).

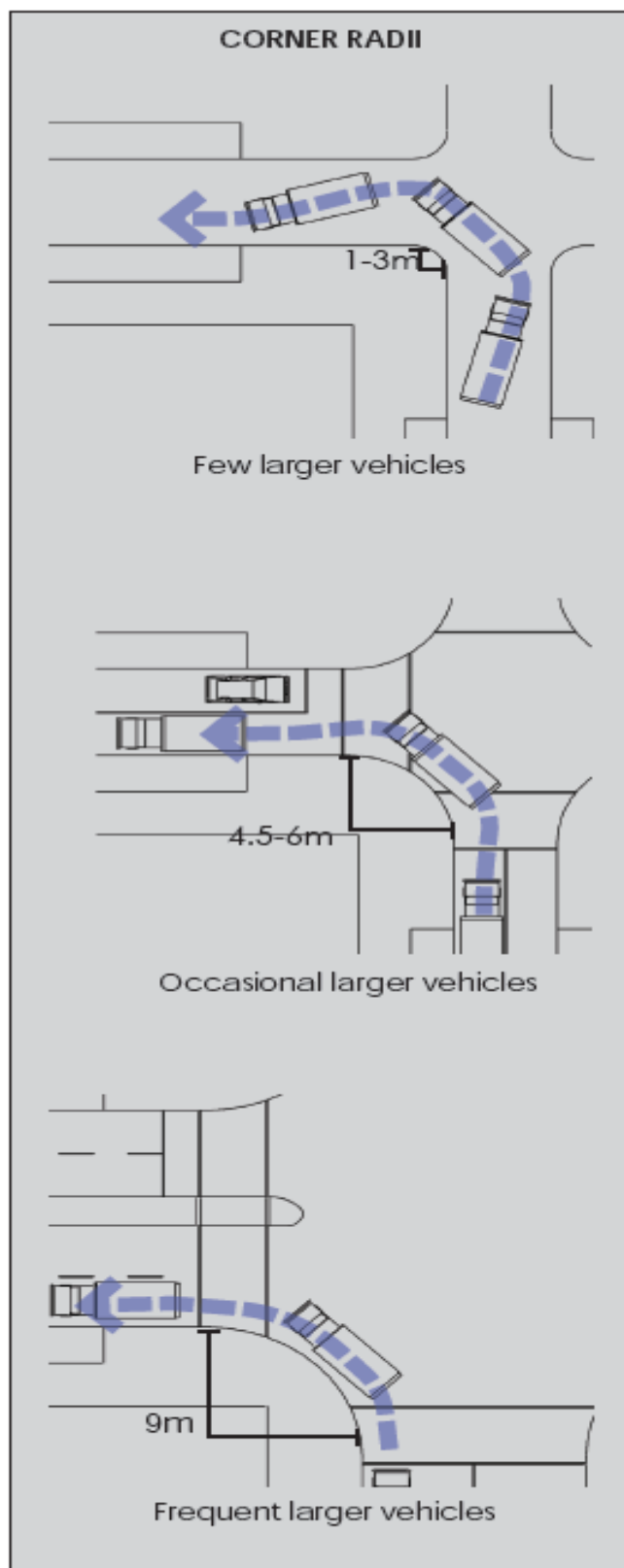
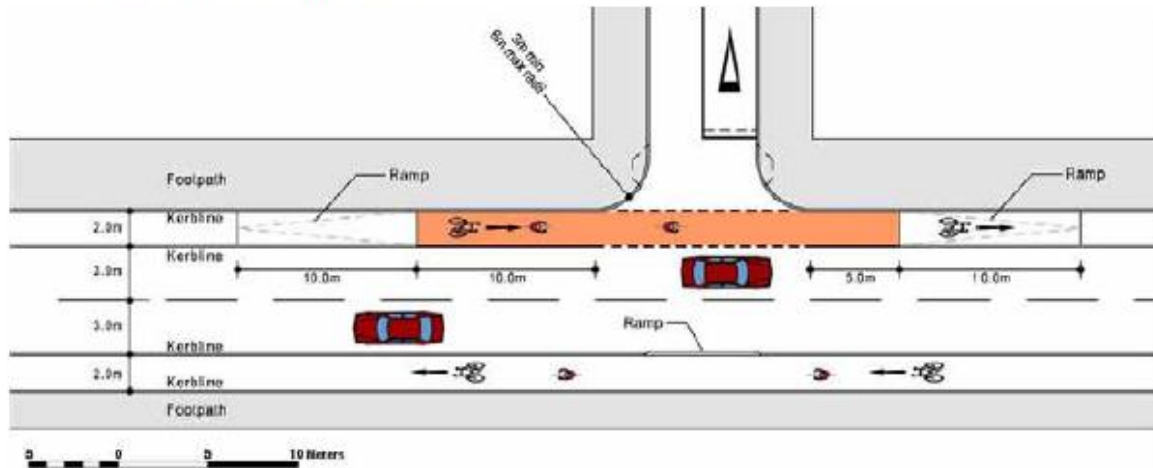


Figure 4.43: Approaches minimising corner radii according to level of service by larger vehicles.

National Cycle Manual – Extracts from Section 4.9 Side Roads and T-Junctions

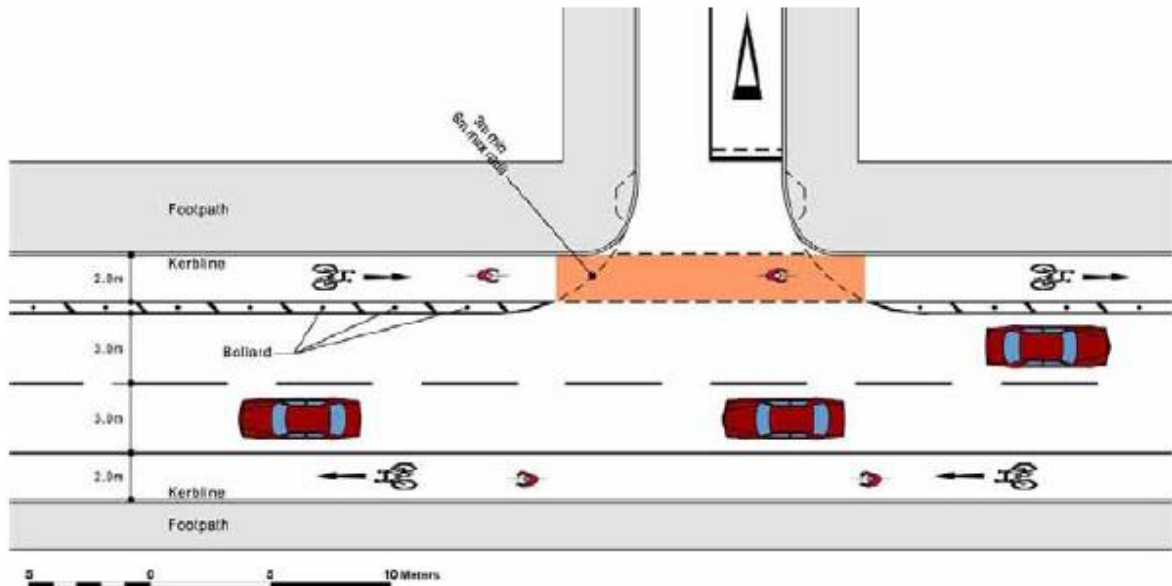
General Arrangement for Side Roads



- Narrow side road in built up areas (6-7m, plus cycle lanes, if provided)
- For urban centres, stop or yield line at / behind rear of footpath
- Vehicle on side road makes two-stage progress, first across pedestrian crossing area, and then across cycle lane to enter traffic
- Pole for stop / yield located at rear of footpath, away from desire line for pedestrians
- Kerb radii tight (3-5m)
- Mandatory cycle lane approaching junction, to provide cycle space and preclude parking
- Red coloured surface commencing 20.0m in advance of the side road to improve legibility
- Cycle lane brought across mouth of junction
- Cyclists opposite side road may stop / slow to make direct crossing, or take central position in traffic lane before making right hand turn



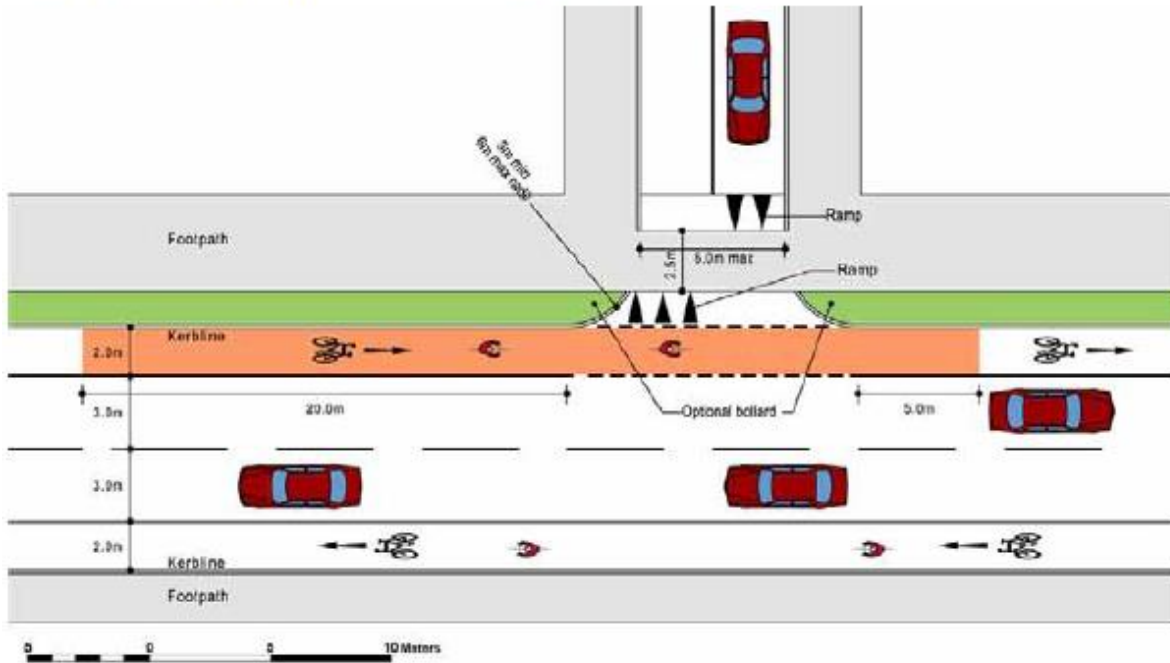
Side Road joining Street with Segregated Cycle Facility



- Narrow side road in built up areas (6-7m, plus cycle lanes, if provided)
- For urban centres, stop or yield line at / behind rear of footpath
- Vehicle on side road makes two-stage progress, first across pedestrian crossing area, and then across cycle lane to enter traffic
- Pole (not shown) for stop / yield located at rear of footpath, away from desire line for pedestrians
- Kerb radii tight (3-5m)
- Segregated cycle lane approaching junction, to provide cycle space and preclude parking and ensure cyclist are not encroached by turning vehicles
- Cycle lane brought across mouth of junction in red colour
- Cyclists opposite side road may stop / slow to make direct crossing, or take central position in traffic lane before making right hand turn



Minor Side Road with Pedestrian Priority



- Minor side roads and access streets in built up areas up to 6.0m wide
- Continuous footpath with vehicle cross over
- Vehicles on side road edge out slowly across the footpath and then into traffic
- Kerb radii tight (3-5m)
- Mandatory cycle lane approaching junction, to provide cycle space and preclude parking
- Red coloured surface commencing 20.0m in advance of the side road to improve legibility
- Cycle lane brought across mouth of junction
- Cyclists opposite side road may stop / slow to make direct crossing, or take central position in traffic lane before making right hand turn



Appendix B - Before/After Photos of Junction Improvement Schemes

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The Mall, Castlebar – Junction Tightening with raised crossing



Circular Road, Navan – Junction Tightening with raised crossing



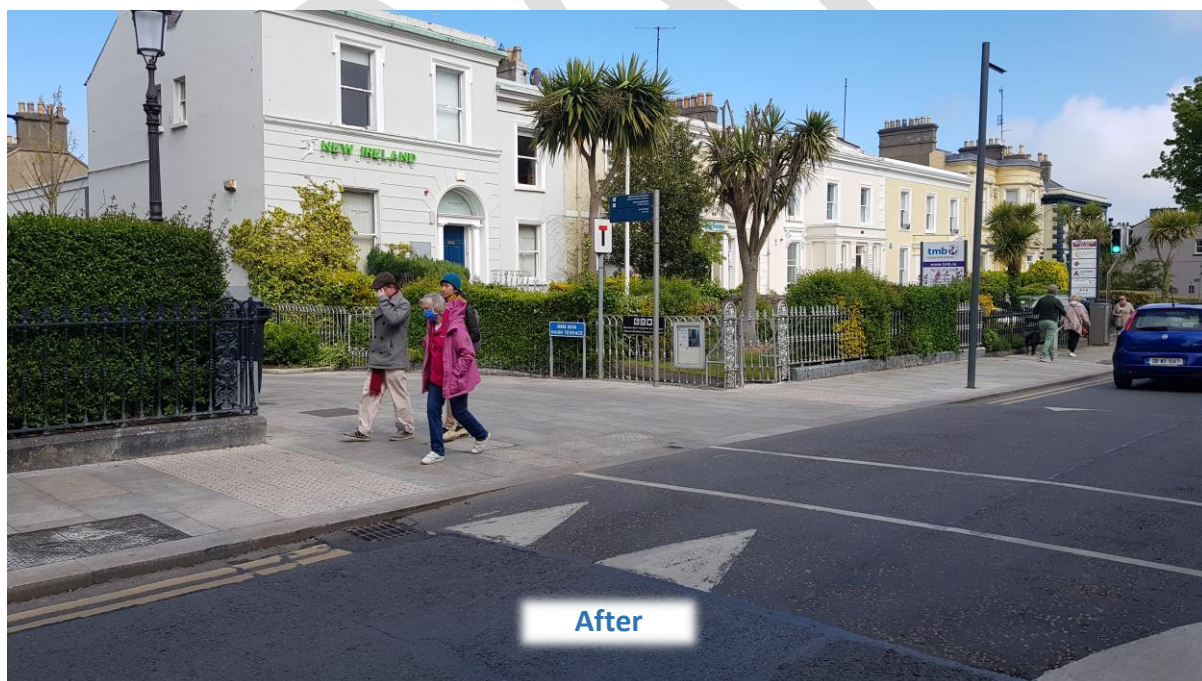
Main Street, Prosperous – Junction Tightening with raised crossing



Barrack Street, Cork – Junction Tightening with raised crossing



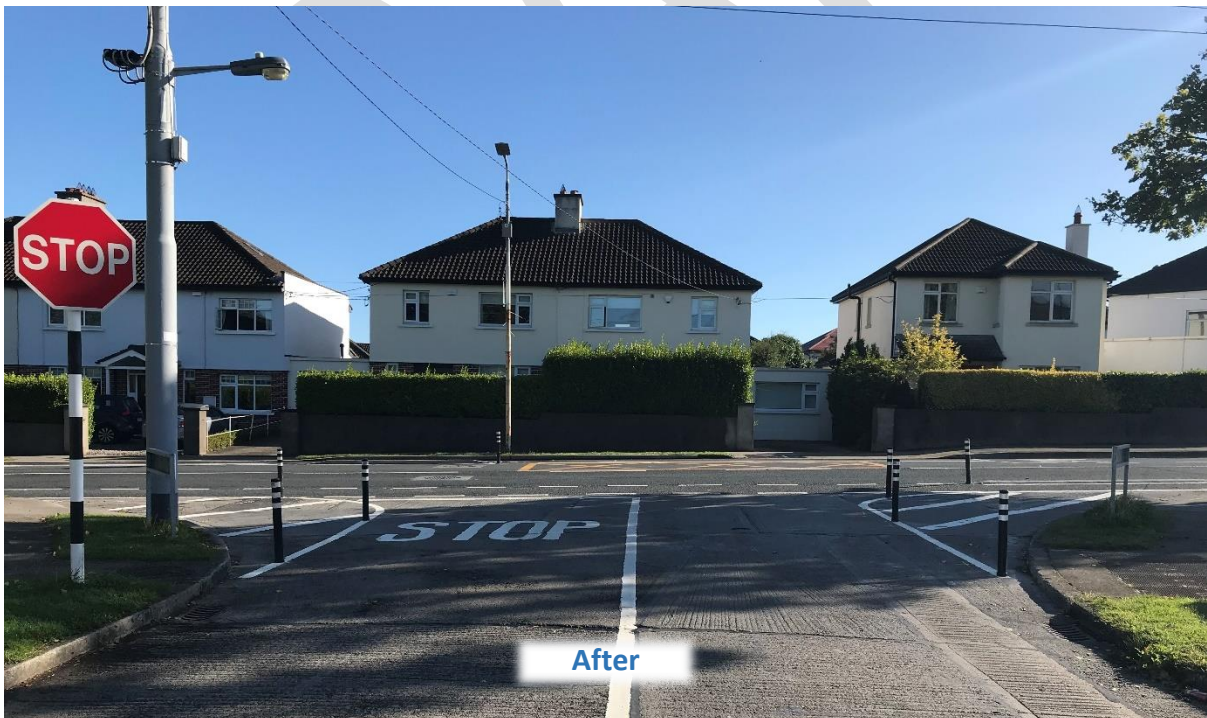
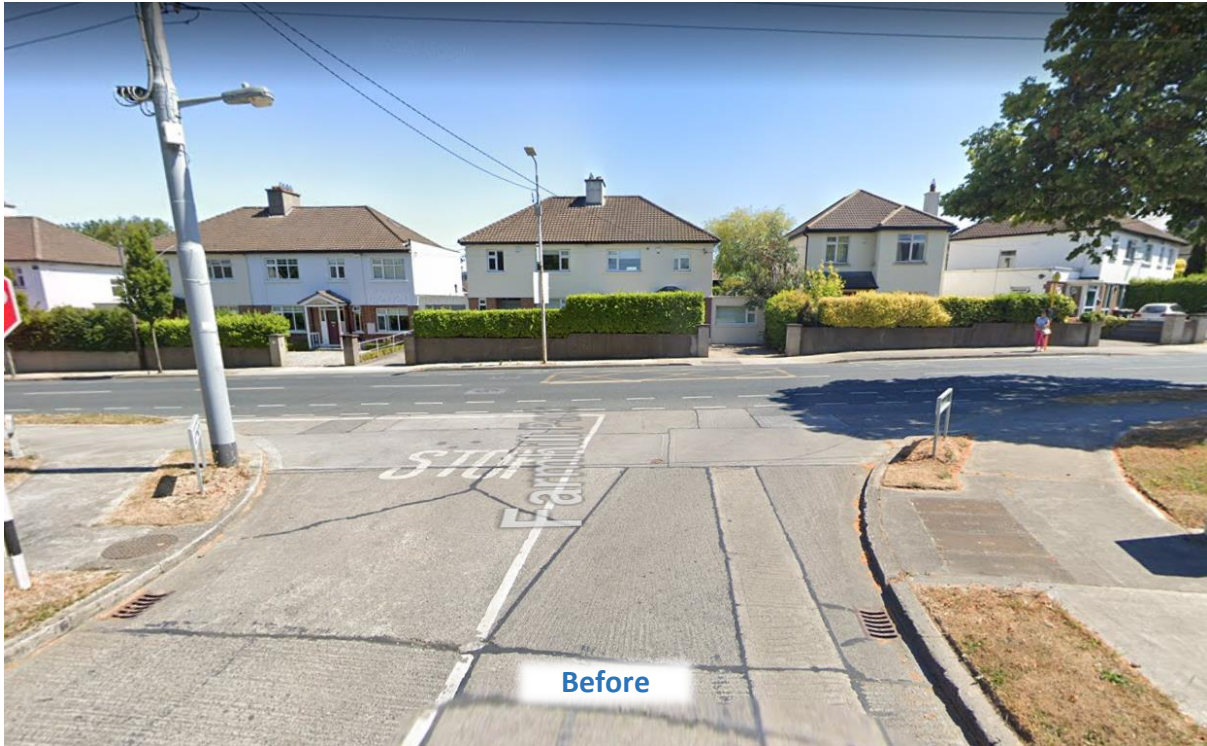
George's Street Upper, Dun Laoghaire – Continuous Footpath



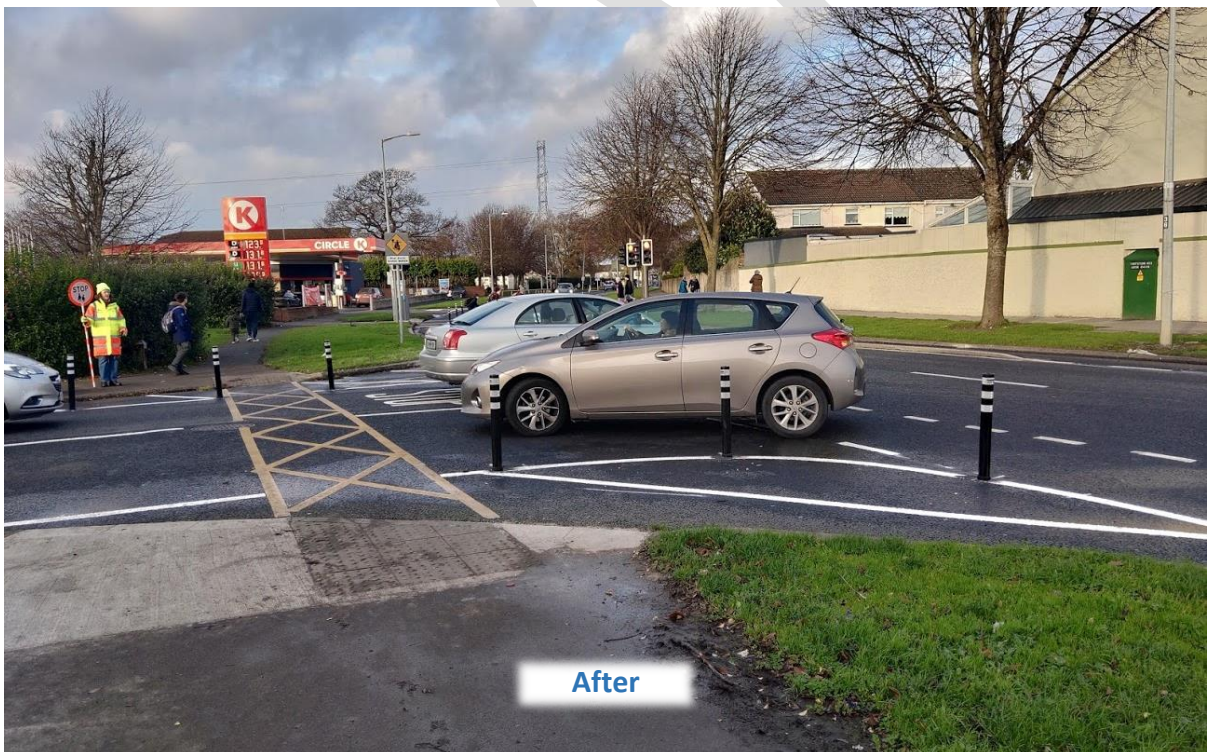
Main Road, Tallaght – Tight junction with dished crossing



Goatstown Road, Dublin – Temporary Junction Tightening Measures

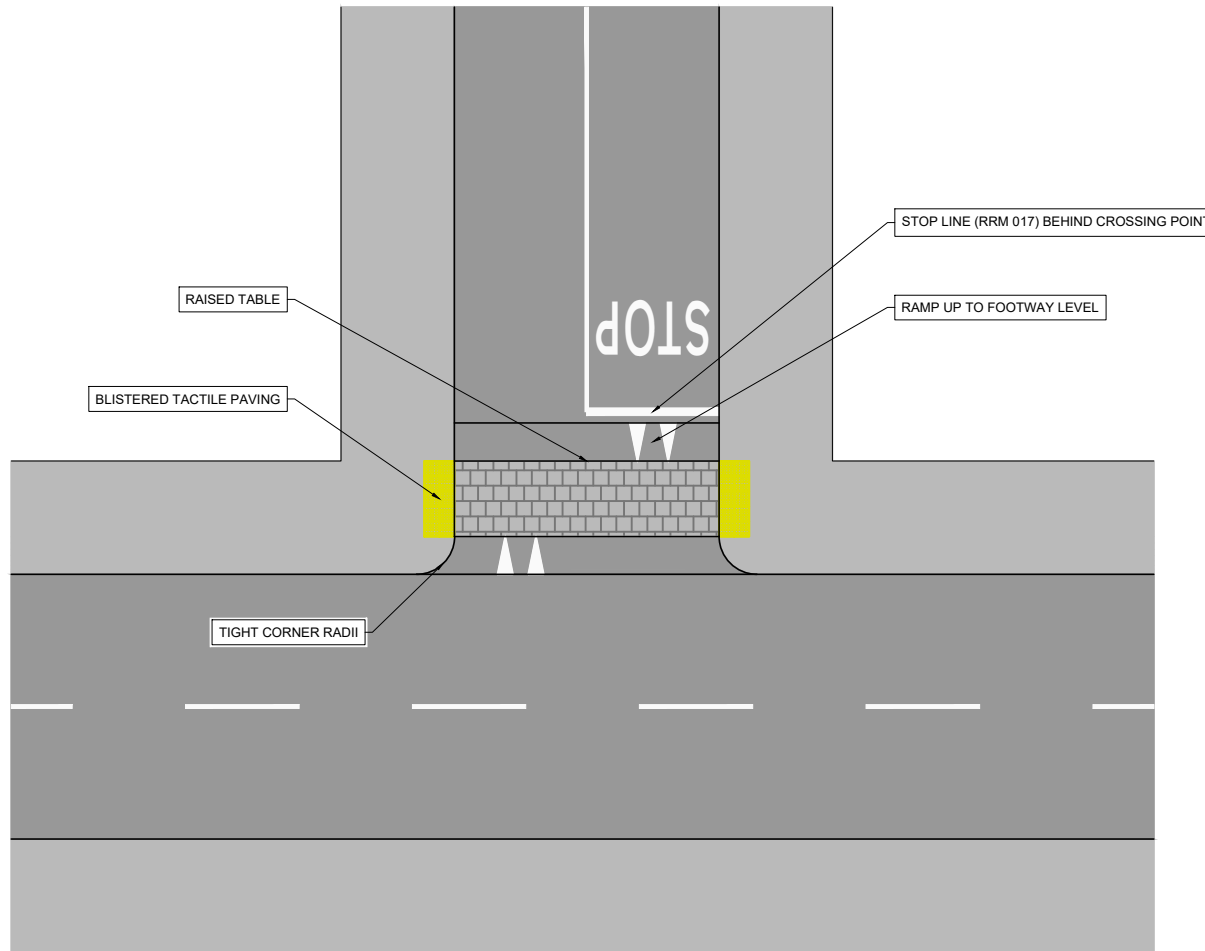


Hartstown Road, Dublin – Temporary Junction Tightening Measures



Appendix C – Typical Priority Junction Layouts

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National Transport Authority
 Design Section
 Dún Scéine
 Harcourt Lane
 Dublin 2

T. +353 1 881 8300 (Main switch)

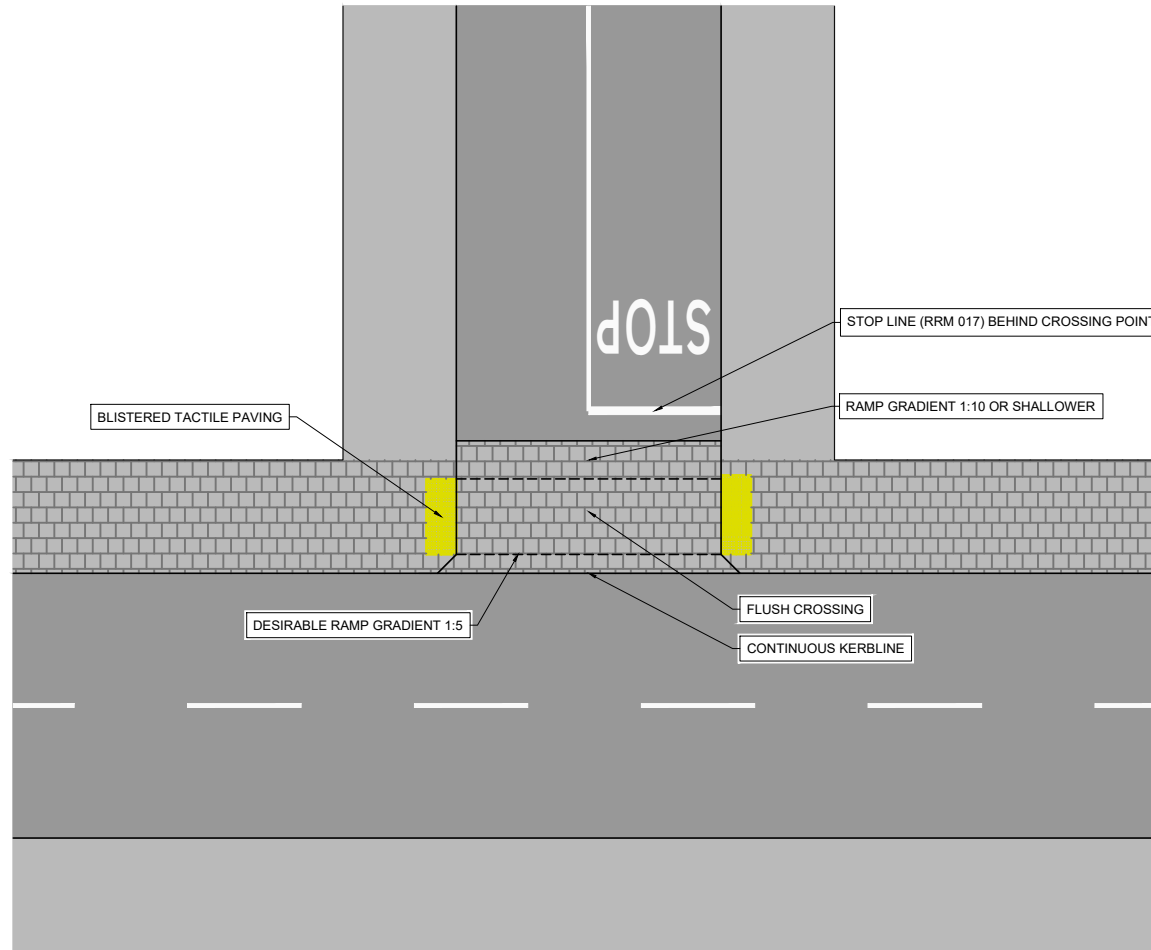
Údarás Náisiúnta Iompair
 An Rannóg Deartha
 Dún Scéine
 Lána Fhearchair
 Baile Átha Cliath 2

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Title

PRIORITY JUNCTION WITH RAISED CROSSING -
 TYPICAL LAYOUT

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Drm	Chk'd	App'd	Date of Issue	STANDARDS	NTA-SCD-1160.02	-



National Transport Authority
 Design Section
 Dún Scéine
 Harcourt Lane
 Dublin 2

T. +353 1 881 8300 (Main switch)

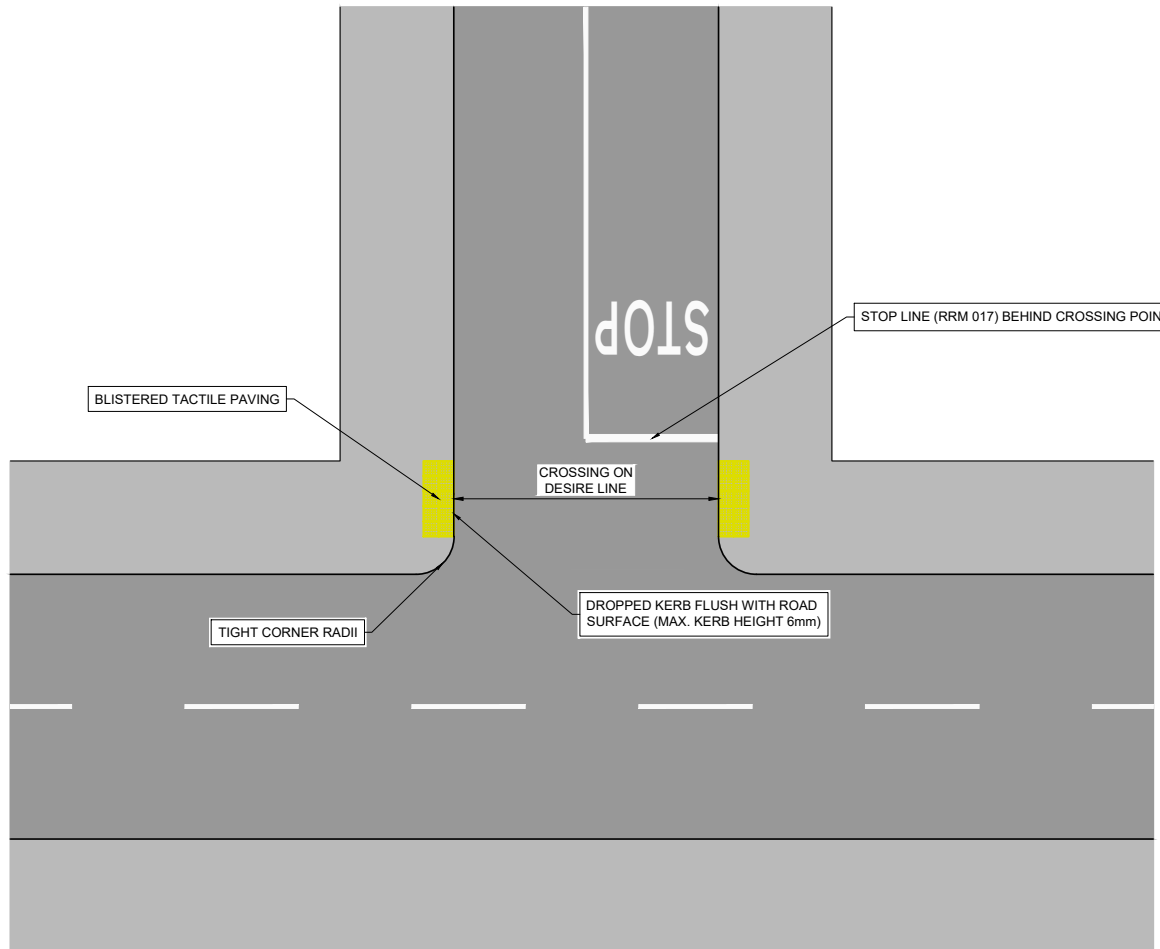
Údarás Náisiúnta Iompair
 An Rannóg Deartha
 Dún Scéine
 Lána Fhearchair
 Baile Átha Cliath 2

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Title

CONTINUOUS FOOTWAY

-	-	-	-	Documentation Set	Drawing File Number	Rev
Drn	Chk'd	App'd	Date of Issue	STANDARDS	NTA-SCD-1160.03	-



National Transport Authority
 Design Section
 Dún Scéine
 Harcourt Lane
 Dublin 2

Údarás Náisiúnta Iompair
 An Rannóg Deartha
 Dún Scéine
 Lána Fhearchair
 Baile Átha Cliath 2

T. +353 1 881 8300 (Main switch)

DRAFT

Title

PRIORITY JUNCTION WITH DISHED CROSSING - TYPICAL LAYOUT

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Drm	Chk'd	App'd	Date of Issue	STANDARDS	NTA-SCD-1160.01	-