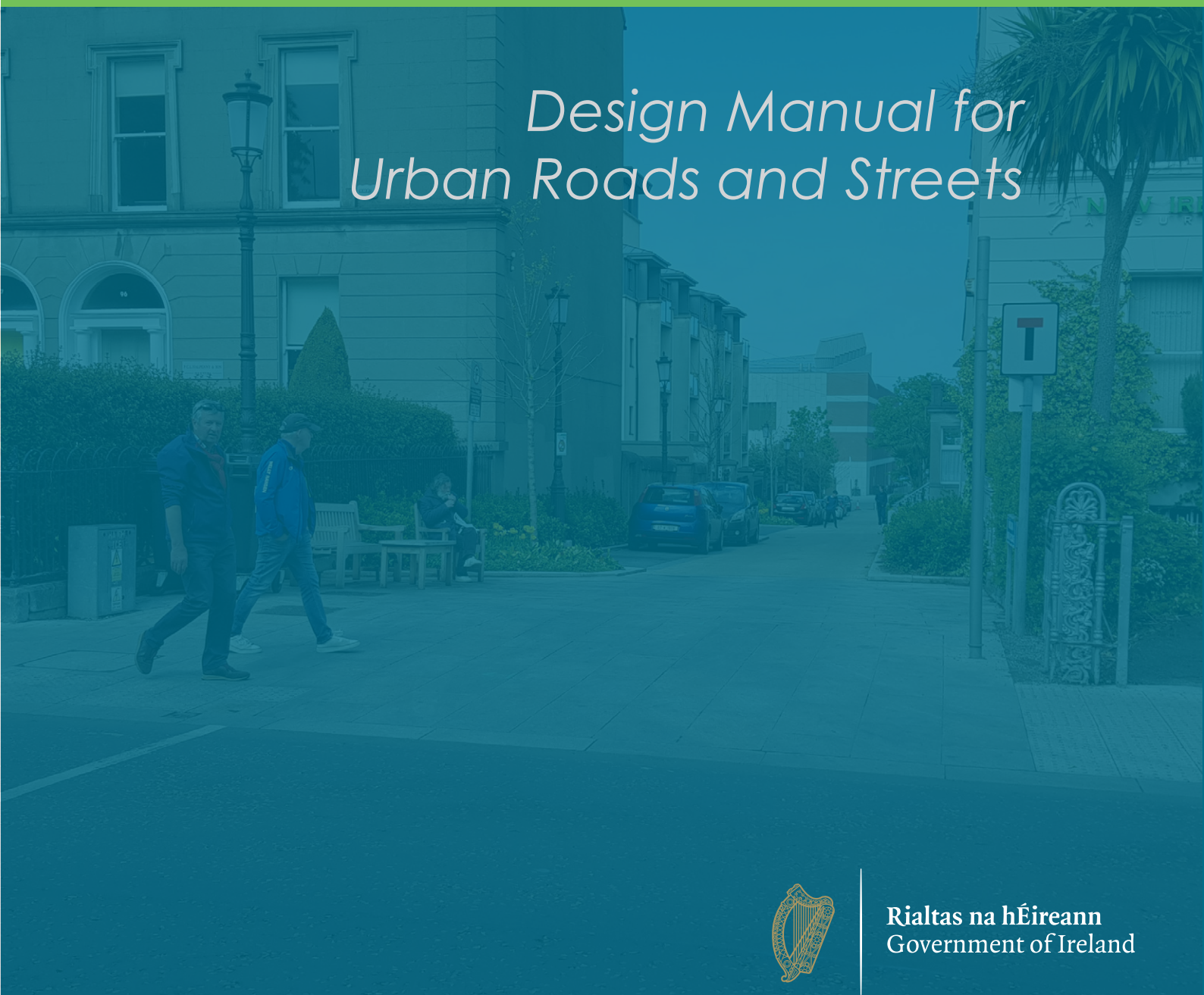
Advice Note 6
Priority Junction Tightening Measures

Design Manual for Urban Roads and Streets



Rialtas na hÉireann
Government of Ireland

Design Manual for Urban Roads and Streets (DMURS)

Advice Note 6 - Priority Junction Tightening Measures has been prepared by the National Transport Authority, following on from the Active Travel 2021 Programme and the allocation of funding to Local Authorities for "Low-Cost Junction Tightening/Pedestrian Crossing Schemes". The Advice note expands upon this Programme and the principles, approaches and standards of DMURS to provide a range of design solutions to junction design, with a focus on the retrofitting of existing junctions. These are presented with reference to the place context/movement function of any particular priority junction, so as to improve the safety and comfort of vulnerable road users at existing priority junctions and pedestrian crossings in cities, town and villages around the country.

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

An Roinn Iompair
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NTA
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National Transport Authority

George's Street Upper/Haigh Terrace, Dun Laoghaire

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Dorset Street/Innisfallen Parade, Dublin

1. Introduction

The layout and geometry of priority junctions in urban areas can have a significant impact on the safety and comfort of people using the junction, particularly those using active transport modes of walking, wheeling and cycling. Historically, most priority junctions in urban areas were designed to standards more applicable to rural roads which prioritised the movement of vehicular traffic, often at the expense of other road users. See further details in Section 2 below.

The Design Manual for Urban Roads and Streets (DMURS) is the standard to be applied to the design of all urban roads and streets (with a speed limit of 60 km/h or less), with limited exceptions, and DMURS requires that pedestrians be given the highest design consideration in urban roads and street designs (Ref. DMURS section 2.2.2):

> *'To encourage more sustainable travel patterns and safer streets, designers must place pedestrians at the top of the user hierarchy. 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 priority junctions are critical links on any pedestrian route and often represent an area of potential conflict between pedestrians and vehicular traffic, it is important that the layout and geometry of priority junctions facilitates and prioritises the safe passage of pedestrians in accordance with national sustainable transport policy

Funding has been made available in recent years through the Active Travel Programme, administered by the National Transport Authority (NTA), for junction tightening measures to improve existing priority junctions in urban areas. These measures can often be relatively quick and cheap to implement. Junctions can be improved in isolation or as part of a wider package of works and the improved junctions can significantly enhance the environment for both pedestrians and other road users.

This purpose of this Advice Note is 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 the design of new priority junctions in urban areas.

Designers should also refer to the guidance in DMURS sections 4.3 and 4.4 on designing pedestrian environments and carriageway / junction design.

Design of cycle facilities at priority junctions.
Designers should note that this advice note does not cover the design of dedicated cycle facilities at priority junctions. Designers should refer to specific guidance on this topic in the National Cycle Manual (www.cyclemanual.ie) and should note that an updated version of the Cycle Manual is due to be published in 2023 which will contain updated guidance on the design of cycle facilities at priority junctions.

2. Typical legacy issues at priority junctions

As mentioned above, many legacy priority junctions in urban areas have been designed with the primary aim of facilitating ease of movement of vehicular traffic. These legacy junctions can often be hostile environments for people walking, wheeling or cycling. Typical features of legacy priority junctions can include:

- large corner radii that encourages high vehicle turning speeds;
- wide junctions that can encourage unofficial two lane exits which can impact on the safety performance of the junction;
- poor pedestrian crossing facilities due to large crossing distances, crossings located away from desire lines and often incorrect tactile paving.

Figure 2.1 to 2.3 below show examples of legacy priority junctions with such features.

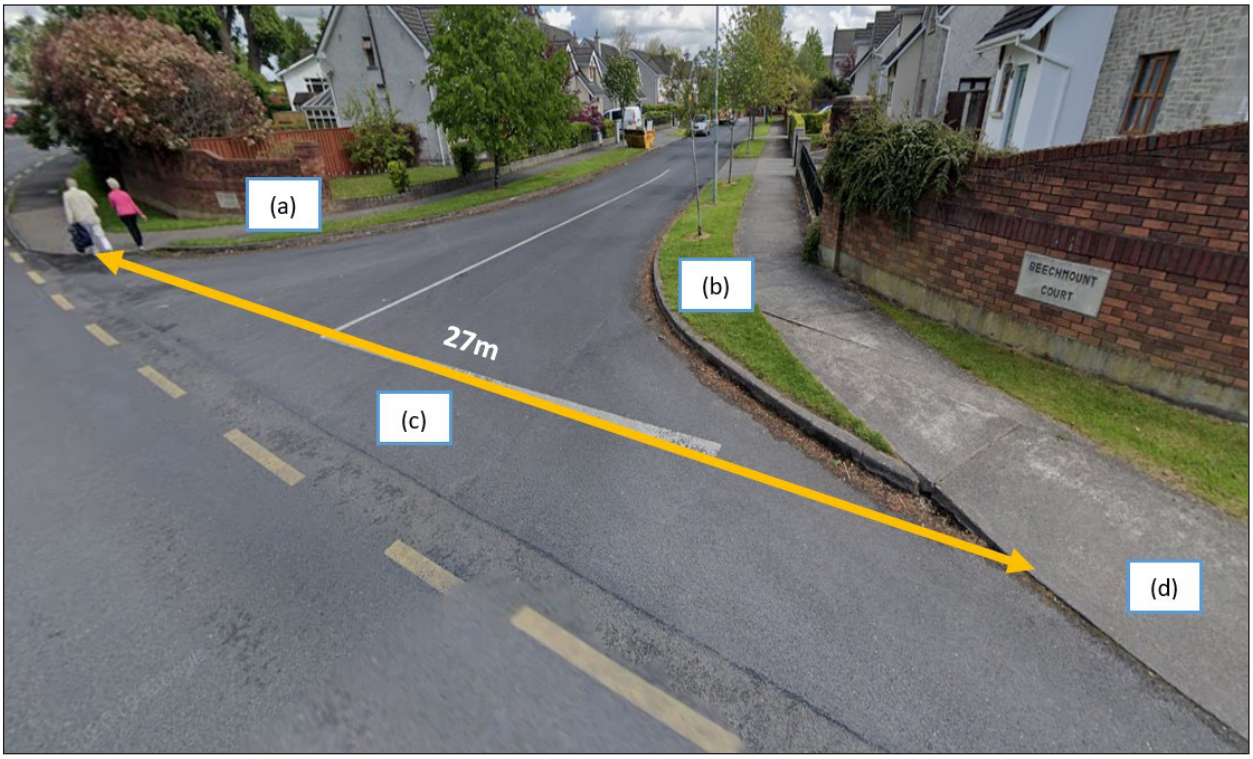


Figure 2.1: Typical Design Problems: (a) & (b) Priority junction with large corner radii, (c) approx. 27m crossing distance and (d) no tactile paving (image base Google Street View).

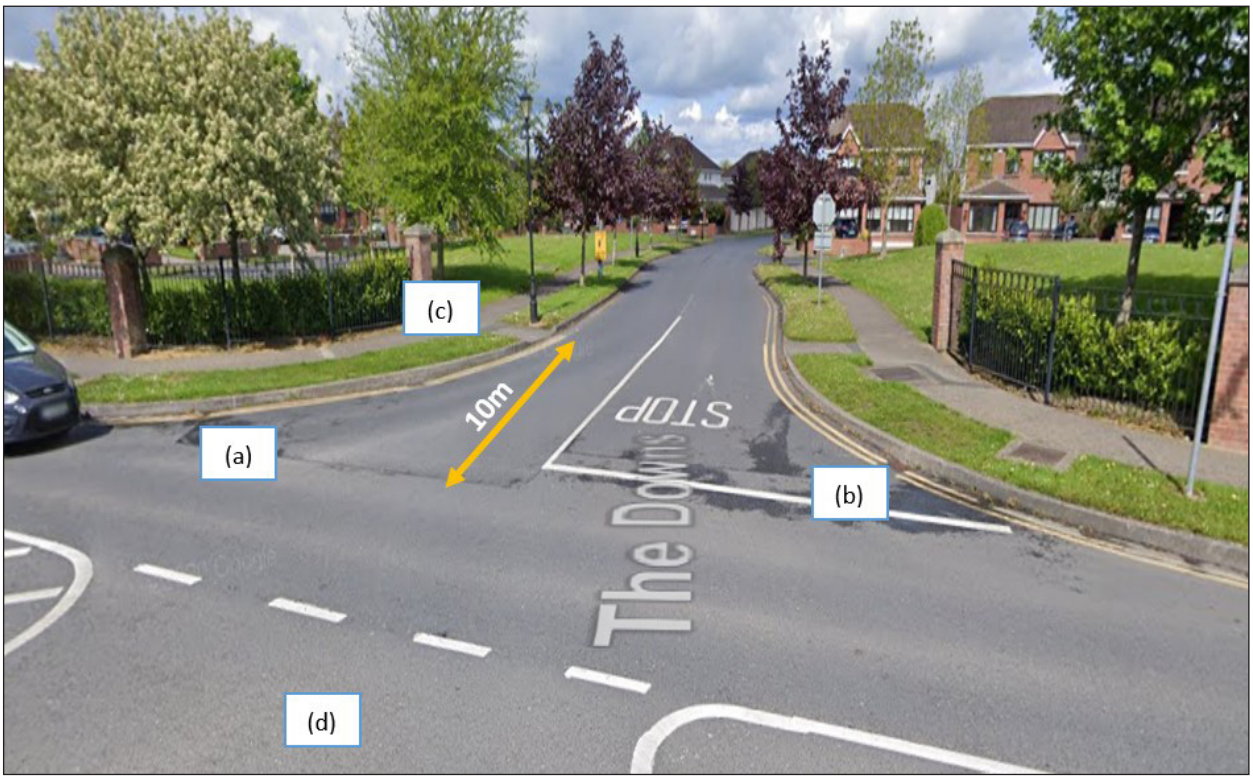


Figure 2.2: Typical Design Problems: (a) & (b) Priority junction with large corner radii , (c) pedestrian crossing located away from pedestrian desire lines and (d) right-turn pocket on main road (image base Google Street View).

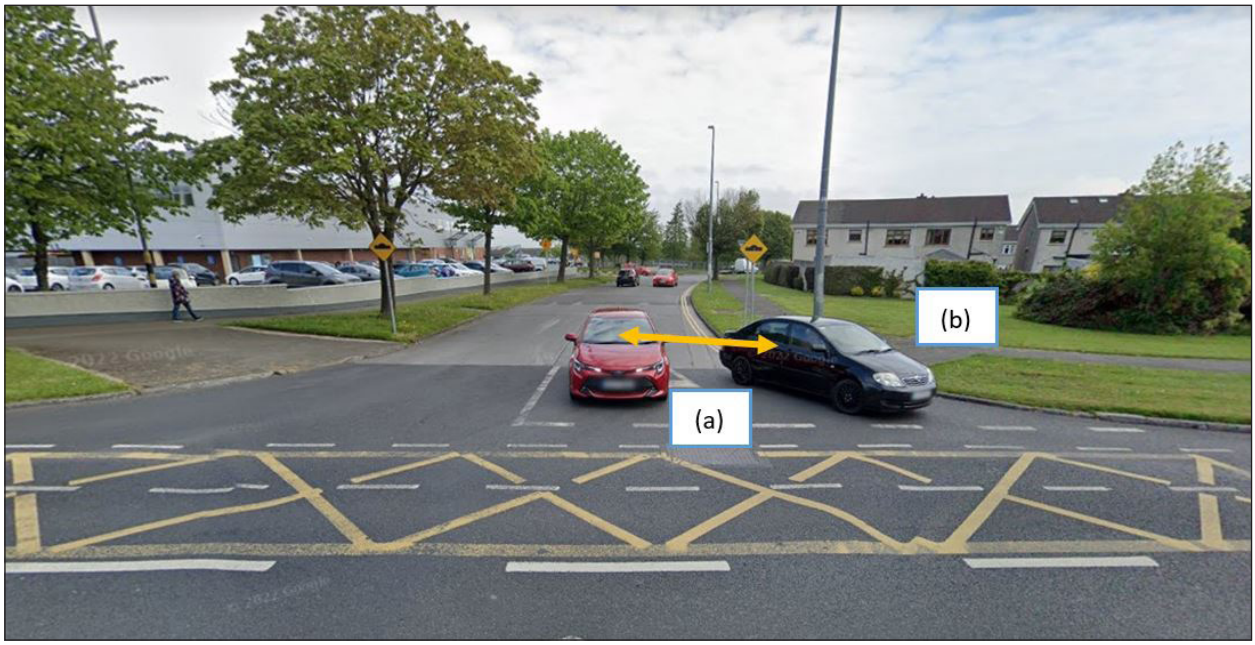


Figure 2.3: Wide priority junction encouraging unofficial two lane exits; additional vehicles in the junction can impede driver's sight visibility (a) and block crossing facilities (b) which can negatively impact the safe use of the junction for all modes (image base Google Street View).

3. Measures to Improve Existing Priority Junctions

3.1. Key Design Principles

3.1.1 Homogeneity

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

> *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:

- 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)

Refer also to Section 4.4.1 and 4.4.7 of DMURS.

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 priority 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

3.2. Typical Design Interventions

Below are some of a suite of interventions to consider when improving urban priority junctions (see DMURS Sections 4.3.2 Pedestrian Crossings, 4.3.3 Corner Radii)

- 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 10m
- 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. Continuous footpaths ("crossovers") over very lightly trafficked side streets/ entrances;

ii. Junction tightening with raised crossing;

iii. Junction tightening with dished crossing;

and

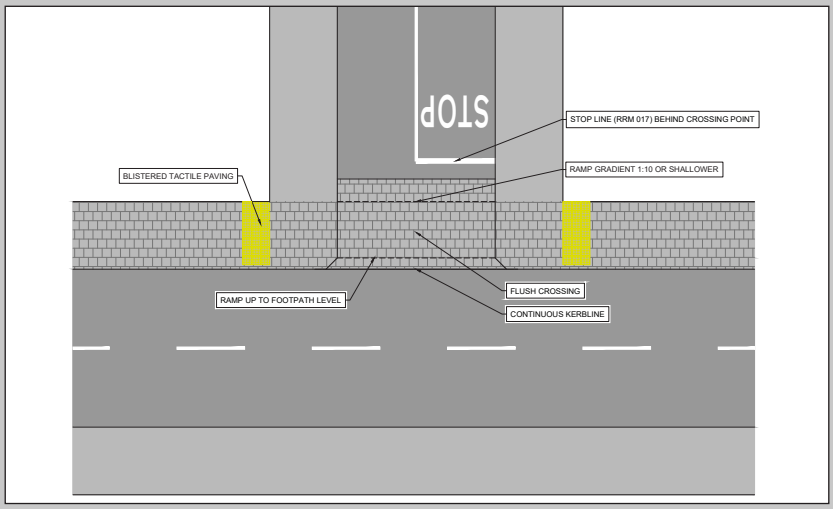
iv. Interim junction tightening measures..

Further Examples, before and after, are also provided in Appendix 1.

i: Typical Layout of a Continuous Footpath, Examples and Key Features

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).



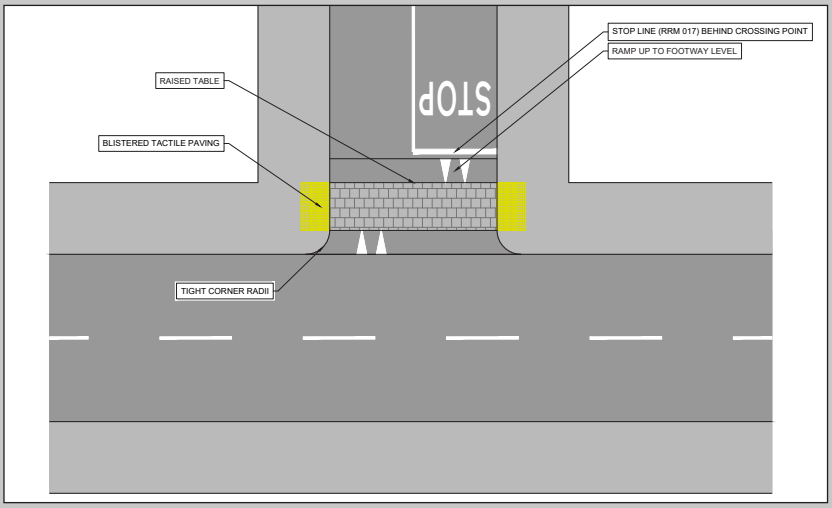
Georges Street, Dun Laoghaire

Castlebar, Co. Mayo

Key Features	Suitable Locations (refer to Table 3.1 also)
- Kerbline continues straight across the junction. - Footpath height and 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.	- Priority junctions in urban centres and neighbourhoods. - Streets with high pedestrian volumes - Low traffic flows on side road/street. - Across private entrances e.g. houses, apartment blocks, shopping centres, filling stations, commercial premises, car parks.
	Other Considerations
	- Consider complementary traffic calming measures on approach roads/streets. - Maintain adequate sightlines (see DMURS for guidance). - Ensure adequate drainage at crossings to avoid surface water ponding. - Ensure correct tactile installations.

ii: Typical Layout of Priority Junction with Raised Crossing, Examples and Key Features

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.



Dorset Street, Dublin

Castlebar, Co. Mayo

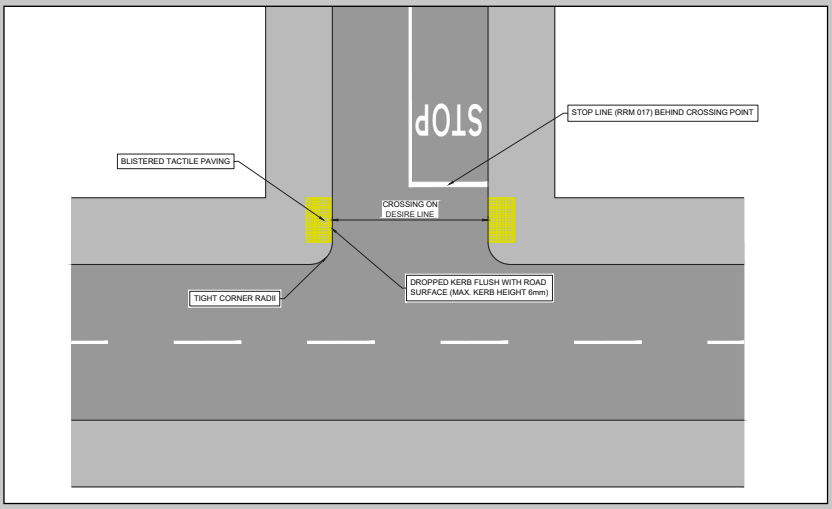
Westport, Co. Mayo

Key Features	Suitable Locations (refer to Table 3.1 also)
- 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 crossing point. - 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.	- Priority junctions with low to moderate traffic volumes where enhanced pedestrian priority is desirable based on function and context. - Priority junctions with moderate-high pedestrian volumes. **Other Considerations** - Consider complementary traffic calming measures on approach roads/streets - Maintain adequate sightlines (see DMURS for guidance) - Ensure adequate drainage at crossings to avoid surface water ponding - Ensure correct tactile installations

iii: Junction Tightening with Dished Crossing, Examples and Key Features

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



Main Road, Tallaght

Langton Road, Newbridge

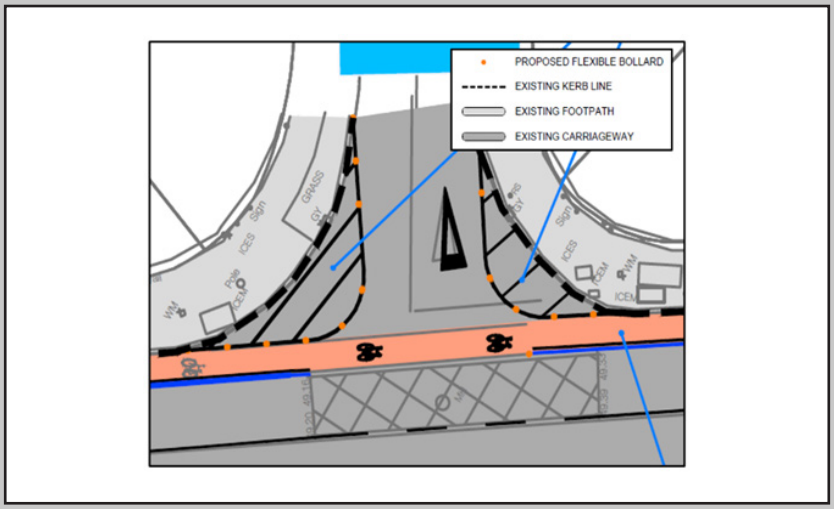
Key Features	Suitable Locations
- Tight corner radii (see DMURS / NCM for guidance). - Single Lane approach from side roads is recommended. - Dropped kerb should be flush with road: if residual kerb is required (for drainage runoff reasons), 6mm max. height of kerb at crossing point. - Tactile (buff) 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.	- Priority junctions with moderate-high traffic flows and low pedestrian volumes. - Typically priority junctions on arterial roads in suburban or business/Industrial areas and all priority junctions in rural fringe locations..
	Other Considerations
	- Consider complementary traffic calming measures on approach roads/streets. - Maintain adequate sightlines (see DMURS for guidance). - Ensure adequate drainage at crossings to avoid surface water ponding. - Ensure correct tactile installations. - Ensure gradients at dished crossings are not excessive, and in accordance with standards (5% or less).

iv: Interim 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.



Goatstown Road, Goastown

Hartstown Road, Hartstown

Key Features	Suitable Locations
- 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 recommended. - Stop line should be located behind the crossing point.	- Suitable as temporary/interim measures at most priority junctions outside urban centres. - As part of temporary/interim active travel schemes. **Other Considerations** -- Ensure dropped kerbs and tactile paving. are provided at existing crossing points. - Consider complementary traffic calming measures on approach roads/streets. - 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.

3.4. Options Matrix

Based on the guidance above regarding potentially suitable locations for each junction treatment option, the table below can be used as a guide to assist designers in the selection of a suitable priority junction type based on the movement function of the main road and the place context of the location. Refer to DMURS Section 3.2 for definitions and guidance on movement functions and place context (see table 3.1).

Note the table below is a guide to the selection of permanent junction improvement treatments. Interim junction tightening measures could also be considered as part of any temporary/ interim schemes and would be suitable for most priority junctions with the exception perhaps of junctions in urban centres.

Table 3.1 Priority Junction Selection Guide
(based on the application of the DMURS Design speed selection matrix)

FUNCTION	CENTRE	N'HOOD	SUBURBAN	BUSINESS/ IN-DUSTRIAL	RURAL FRINGE
ARTERIAL	30-40 KM/H	40-50 KM/H	40-50 KM/H	50-60 KM/H	Transition Zone
LINK	30 KM/H	30-50 KM/H	30-50 KM/H	50-60 KM/H	Transition Zone
LOCAL	10-30 KM/H	10-30 KM/H	10-30 KM/H	30-50 KM/H	50-60 KM/H

CONTEXT

Higher Pedestrian Priority - Consider Continuous Footpath

Moderate Pedestrian Priority - Consider Raised Crossing

Lower Pedestrian Priority - Consider Dished Crossing

Note 1: Design Speed is based on the main street/road to with which the side street intersects.

Note 2: It is not anticipated that continuous footpaths/raised crossing would be commonly used where local streets intersect, however they should be considered on strategic pedestrian/ cycling routes (i.e. school routes), as part of a traffic calming feature (see DMURS Section 4.4.7 Horizontal and Vertical Deflections) and/or where consistent with the application of the National Cycle Manual.

Note 3: See DMURS Advice Note 1 for further information on Transition Zones.

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Appendix 1 - Further Examples (before and After)

George's Street Upper/Haigh Terrace, Dun Laoghaire – Continuous Footpath

Local Street off Link Street within Centre (image Google Street View).

Before

After

Kilmacud Road Lower/Sweet Briar Lane, Kilmacud – Continuous Footpath

Local Street off Link Street within Suburb (image Google Street View).

Before

After

Hanover Street/Riverside, Carlow – Continuous Footpath

Local Street off Link Street within Neighbourhood/Suburb (image Google Street View).

Before

After

The Mall, Castlebar – Junction Tightening with raised crossing.

Local Street off Link Street within Centre/Neighbourhood (image Google Street View).

Before

After

Main Street/Church View Lawns, Prosperous – Junction Tightening with raised crossing

Local Street off Arterial Street within Neighborhood/Suburb (image Google Street View).

Before

After

Wolfe Tone Street/Church Hill,Sligo – Junction Tightening with raised crossing

Local Street off Link Street within Neighborhood (image Google Street View).

Before

After

Main Road/Bancroft Road, Tallaght – Tight junction with dished crossing

Local Street off Link Street within Suburb (image Google Street View).

Before

After

Farmhill Park/Goatstown Road, Goatstown – Interim junction tightening

Local Street off Link Street within Suburb (image Google Street View).

Before

After

Hartstown Road/Inglewood Road, Hartstown – Interim junction tightening

Local Street off Link Street within Suburb (image Google Street View).

Before

After