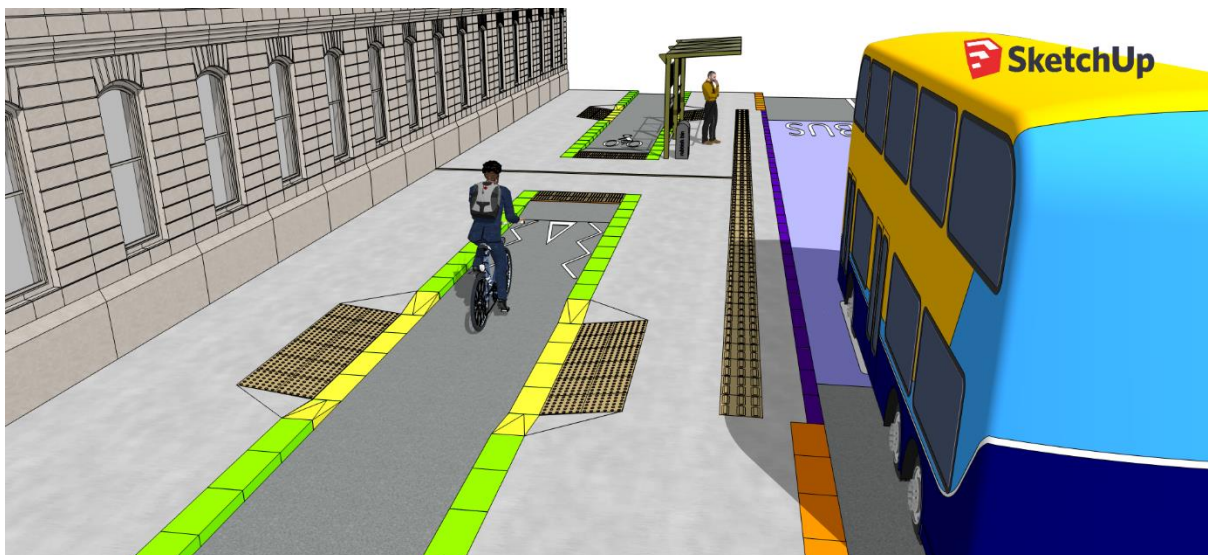


C2CC

Clontarf to City Centre Project Bus Stop Design

January 2021



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1. DOCUMENT SUMMARY

This document was prepared by the project team in Dublin City Council to explain the design of the bus stops along the route of the Clontarf to City Centre Cycle and Bus Priority Project.

2. C2CC PROJECT OVERVIEW

The Clontarf to City Centre Cycle & Bus Priority Project (C2CC Project) will provide segregated cycling facilities and bus priority infrastructure along a 2.7km route that extends from Clontarf Road at the junction with Alfie Byrne Road to Amiens Street at the junction with Talbot Street. The route is identified as a primary route in the Greater Dublin Area Cycle Network Plan, published by the National Transport Authority in 2013.

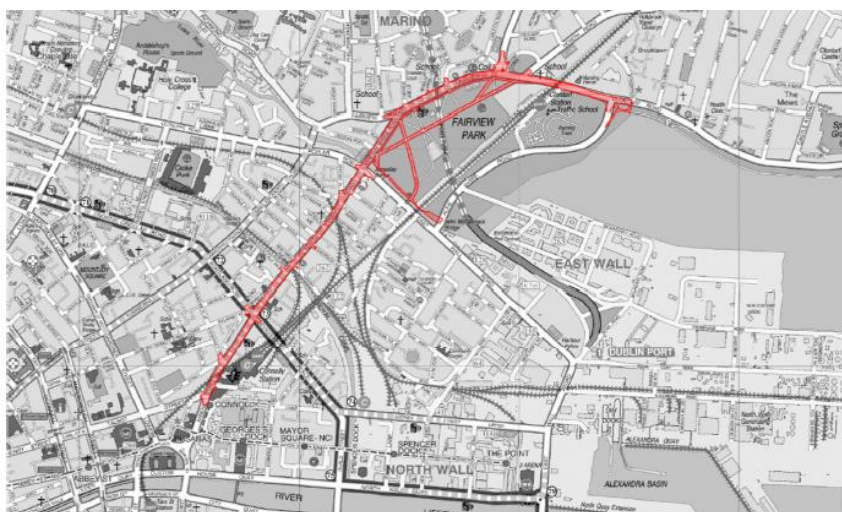


Figure 1: C2CC Project Extents



Figure 2: Greater Dublin Area Cycle Network Plan 2013.

3. DESIGN OF BUS STOPS ON CYCLE ROUTES

The following design standards apply to the design of bus stops on cycle routes:

- The Traffic Management Guidelines, published by the Department of Transport in 2003.
- The National Cycle Manual, published in the National Transport Authority in 2011. Cycle infrastructure funded by the National Transport Authority is required to be designed in accordance with the National Cycle Manual.
- The Traffic Signs Manual, updated in 2019.
- European Standard EN 17161 of 2019: ‘Design for All - Accessibility following a Design for All approach in products, goods and services - Extending the range of users’. This document specifies requirements that enable an organization to design, develop and provide products, goods and

services so that they can be accessed, understood and used by the widest range of users, including persons with disabilities.

- The Design Manual for Urban Roads and Streets, published in 2013 and updated in 2019. This document emphasises that policies and design strategy for urban roads and streets requires a shift away from conventional design solutions towards those which prioritise sustainable modes of transport, safeguard vulnerable road users and promote a sense of place. Reference is made to the requirement to design for vulnerable and mobility-impaired persons when designing bus stops. Mobility-impaired persons include:
 - Persons who are visually impaired, or blind
 - Persons who are hard of hearing, or deaf
 - Persons with children in buggies
 - Wheelchair users and people with crutches

In terms of designing for the visually impaired, the Design Manual for Urban Roads and Streets references the publication 'UK Guidance on the use of Tactile Paving Surfaces (2005)' for design guidance.

Section 5.1.5 of the National Cycle Manual outlines a number of design solutions for the design of cycle tracks passing bus stops, including In-line Bus Stops and Island-Type Bus Stops.

There are two types of **In-line Bus Stops**:

The first is where the cycle track is located on the roadway adjacent to the footpath. This results in conflict between cyclists and buses. The cyclist is blocked by stopped buses, requiring cyclists to wait behind a stopped bus until it moves off, or to overtake the bus on the roadway.

The second type of in-line Bus Stops is where the cycle track runs along the footpath in front of the bus stop waiting area. This results in conflict between cyclists and bus users trying to access or leave the bus. This design is not suitable where there may be high cyclist volumes.

An **Island Bus Stop** is where a cycle track runs between the footpath and the bus stop waiting area and shelter creating, a pedestrian island at the bus stop that is segregated from the footpath. This design resolves the conflicts associated with in-line bus stops, that is, the conflicts between buses and

cyclists on the roadway, and the conflicts between cyclists and pedestrians at the bus stop. However, island bus stops create a potential conflict area on the cycle track behind the bus waiting area, where pedestrians need to cross the cycle track when moving to or from the bus stop.

The diagrams below show two of the options presented in the National Cycle Manual for the design of Island Bus Stops.

The Option 2 design in Figure 3 below shows a bus shelter and waiting area on an 'island', segregated from the main footpath by a cycle track. The cycle track is black asphalt, and runs along the back of the bus shelter and at a lower level than the concrete footpath. A dished crossing is provided on one side of the bus shelter for pedestrians to cross to and from the bus island, with the footpath lowered to cycle track level at the crossing, and grey tactile paving indicated on either side of the dished footpath. In this design, cyclists have priority over pedestrians crossing the cycle track.



Figure 3. Option 2 Island Bus Stop: National Cycle Manual

The Option 2 design was used in a number of schemes, for example, in a section of the Sutton to Sandycove Cycle Track through Clontarf. See Figure 4 below:



Figure 4. Photograph of the Sutton to Sandycove Cycle Track, with a concrete Bus Island at the front of the footpath, and a black asphalt, two-way cycle track running between the footpath and the Bus Island. Two crossing areas are provided, one in advance of the bus shelter, and one past the bus shelter. At the crossings the footpath dishes down to the level of the cycle track and rectangular, buff-coloured tactile paving is provided on the footpath on either side of the crossing. No guidance tactile is provided.

This design was also implemented in London, in some cases with the ramping up of the cycle track to footpath level and with the inclusion of zebra painting on the cycle track at the crossing. Figure 5 below shows an example of this:



Figure 5. Photograph of an Island Bus Stop in London, with a one-way black asphalt cycle track running between a concrete paved pedestrian area and a bus stop island with bus shelter. Two crossings are provided, one on either side of the bus shelter, with the black asphalt cycle track ramping up to footpath level at the crossings. There is zebra painting on the asphalt cycle track at the crossing, and there is L-shaped red tactile paving on the footpath on either side of the cycle track.

The Option 4 design for bus islands in the National Cycle Manual is shown in Figure 6 below. It shows the paved pedestrian area extending across to the bus stop area at the front of the footpath, with a black asphalt cycle track ramping up to footpath level and terminating a few metres in advance of the bus shelter, joining a shared space. The shared space runs behind the bus shelter, for use by cyclists and pedestrians. The cyclist continues behind the bus shelter on the shared space, re-joining the cycle track where it starts again a few metres past the bus shelter, ramping back down to cycle track level. The length of the shared space is about 10 metres. An advisory sign mounted on a pole on the footpath where the cycle track meets the shared space advises the cyclist that the area ahead is for use by pedestrians and cyclists. No prioritisation is indicated and no tactile paving is indicated.



Figure 6. Option 4 Island Bus Stop: National Cycle Manual

The Option 4 design presented above has been used in a number of schemes, including being applied at the intersection of cycle tracks with pedestrian crossings on the Sutton to Sandycove Cycle Route in Clontarf, creating a large area of shared space. See Figure 7 below of a pedestrian crossing on the Sutton to Sandycove Cycle Route:



Figure 7. Photograph of the Sutton to Sandycove Cycle Route: A two-way cycle track runs parallel to a footpath, with the footpath on the inside and adjacent to the sea wall. The cycle track terminates in advance of a signalised pedestrian crossing, creating a shared space. The cycle track is black asphalt and ramps up to footpath level at the start of the shared space. A shared space sign is mounted on a pole on the footpath at the end of the cycle track. Ladder tactile paving is in place at the start of the concrete footpath adjacent to the cycle track. No tramline tactile is in place at the start of the cycle track.

A number of concerns have been raised in relation to conflicts experienced between cyclists and pedestrians where the above designs have been implemented. In particular, it has been considered that the priority of pedestrians in shared spaces is not effectively managed and communicated. This can lead to an unpleasant experience for vulnerable users of the space, especially those with visual and mobility impairments. It is acknowledged in the National Cycle Manual that shared facilities between pedestrians and cyclists generally result in reduced quality of service, and that they should not be considered as a first option.

It has also been noted that tactile paving guidance for the visually impaired has not been appropriately applied at some crossings to bus stop islands, leading to confusion for users. Feedback in relation to the accessibility of the designs, where they have been constructed to include a bus stop 'island' or a large area of shared space, indicates that these designs are not working for all users. Improvements are needed to the design in order to ensure that visually impaired users can locate the crossing to the bus stop area, and can access the bus stop area with comfort, and with the confidence that cyclists will behave courteously, slowing down or stopping before crossing the pedestrian route.

4. C2CC PROJECT: DETAILED DESIGN OF BUS STOPS

In the detailed design of the bus stops on the Clontarf to City Centre Project, particular emphasis was placed on developing a design that resolved the potential conflicts between pedestrians and cyclists, and that communicated a clear hierarchy of prioritisation between users. A workshop was held with the DCC project team, consulting engineers Roughan & O'Donovan, and a road safety auditor in order to work through all design options and select an optimum solution.

An audit of previous designs and a review of previously constructed schemes had highlighted problems relating to the appropriate use of tactile paving and the clarity of prioritisation of pedestrians at the crossings. The inclusion of the buff-coloured rectangular tactile paving at crossings was considered by the auditor to be an indication of a hazard to visually impaired users and a warning not to cross without assistance. It therefore could not guide visually impaired users to and from the bus stop.

Consideration was given on whether to include a zebra crossing with Belisha beacons, or a signalised push-button crossing, to facilitate the movement of pedestrians to and from the bus stop area. However, this was considered unfeasible for the Clontarf to City Centre Project due to the pedestrian and cyclist volumes involved, and the limited space available. The introduction of signalised crossings would require additional street infrastructure in the form of poles, traffic light control boxes and chambers, which would cause additional obstructions to pedestrians and cyclists. In addition, the inclusion of a signalised crossing would imply that, by default, cyclists have priority through bus stop areas. This was not the desired design objective. Reliance on crossings controlled by lights would likely result in unnecessary delays to both pedestrians and cyclists, which would then encourage breaches of the lights, and lead to a general lack of compliance and co-operation in the space.

Future maintenance problems were also taken into account. Where a design solution increases in complexity, the possibility for future disruption of the area for maintenance and repair is increased. Overall, the inclusion of signalised controlled crossings along the route was not considered to be an optimal design solution when compared with other proposals.

The final design solution developed is shown in Figures 8 and 9 below.

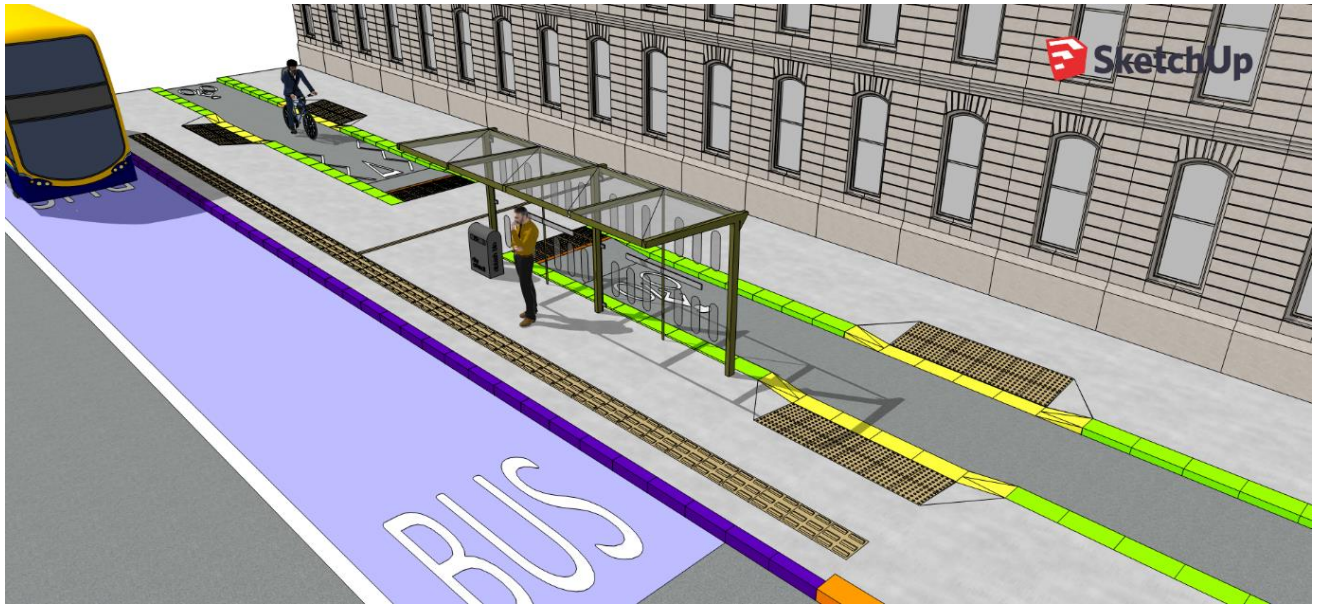


Figure 8. Final Design for Bus Stops on the Clontarf to City Centre Project.

Figure 8 above shows a footpath, cycle track and bus stop area with bus shelter. The black asphalt, one-way cycle track runs between the footpath and bus stop area. The cycle track is 60mm below the level of the footpath, and is between 1.6 metres and 2 metres wide. The footpath paving material is light grey concrete, or granite paving slabs, and is about 2 metres wide. Three crossings are provided for pedestrians to move between the bus stop waiting area and the footpath. Two of the crossings have a dished footpath to cycle track level, with a rectangle of buff-coloured tactile paving on the dished section of footpath to indicate a hazard to visually impaired users. These crossings are about 3 metres wide. Cyclists have priority through these crossings, with pedestrians expected to give way to cyclists before using the crossing.

The third crossing is the main crossing. It is adjacent to the bus stop shelter and is about 3 to 4 metres wide (from the point of view of the pedestrian). The footpath paving material extends across the cycle track, interrupting the cycle track and emphasising pedestrian priority. The cycle track ramps up to footpath level, with a yield marking painted on the cycle track for cyclists, and with a short section of tramline tactile paving at the top of the cycle track on either end of the paved crossing. The crossing is wide enough to accommodate a number of users. Guidance tactile is provided across the footpath from the back of the path to the edge of the bus stop to guide visually impaired users to and from the bus stop. The image shows a narrow guidance strip, approximately 50 millimetres wide and 5 millimetres high. Details of the type of guidance tactile

to be used remains to be agreed, as the guidance tactile paving specified in the UK guidance document may not be suitable at this location.

The main crossing provides a clear pedestrian priority route to the bus stop, with emphasis on facilitating all pedestrians including mobility impaired, visually impaired, vulnerable pedestrians and wheelchair users. The main crossing is a pedestrian route, over which cyclists must cross at a safe speed. As such, there is no shared space proposed in the design. In addition, there is no 'island' created at the bus stop area.

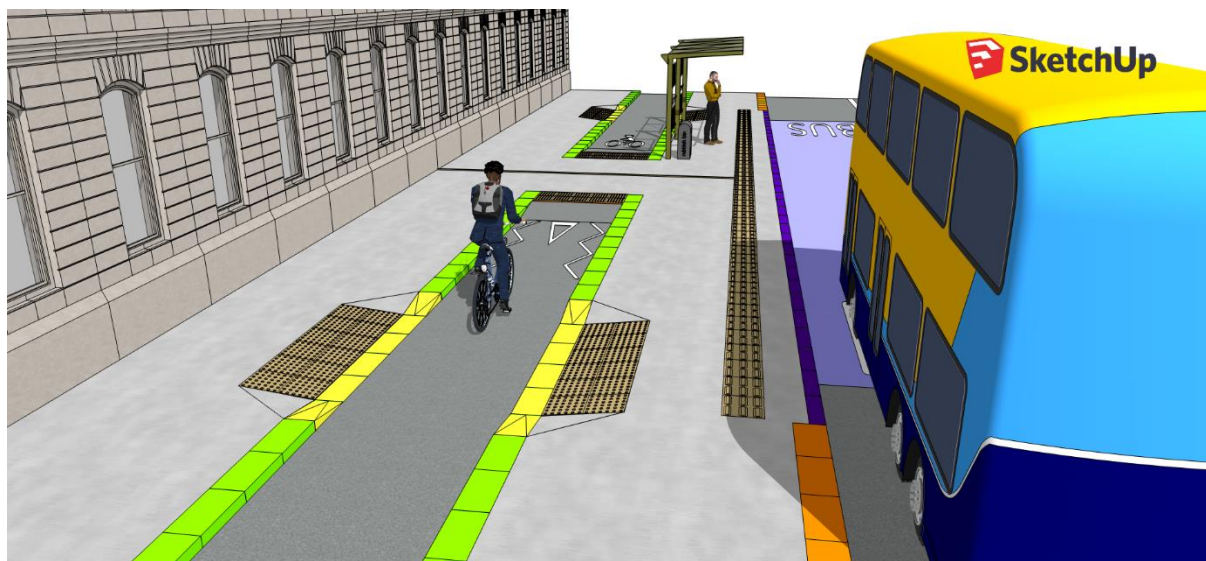


Figure 9. View 2 of the design for Bus Stops on the Clontarf to City Centre Project. Three crossings are provided, the main crossing with pedestrian priority, and two additional ditched crossing with cyclist priority.

It is believed that this design resolves the problems highlighted with previously constructed proposals, and provides a number of improvements. The cyclists will have fewer ramps to negotiate than if three ramped crossings were provided, vulnerable pedestrians and wheelchair users are better protected and better guided towards the bus stop, and the design is simple and more likely to encourage co-operation between pedestrians and cyclists. It is also a more sustainable solution in terms of construction and maintenance costs, as there will be fewer ramps and fewer drainage issues to address. In addition, it does not require installation of pedestrian lights with associated ducting, street clutter, additional risks when they fail, and problems with future maintenance.

This design implementation will be supported by an information and video advertisement campaign to clarify the appropriate use of this public space, to reinforce the prioritisation of pedestrians at the main crossing, and to encourage co-operation and courtesy between users.

5. REFERENCES

- 1) National Cycle Manual, published by the National Transport Authority in 2011, [Web Link](#).
- 2) Greater Dublin Area Cycle Network Plan, published by the National Transport Authority, 2013, [Web Link](#).
- 3) Design Manual for Urban Roads and Streets, published by the Department of Transport and Department of Local Government in 2013 and 2019, [Web Link](#).
- 4) Guidance on the Use of Tactile Paving Surfaces, Department of Environment and Transport in the United Kingdom, [Web Link](#).
- 5) European Standard EN 17161:2019 'Design for All – Accessibility following a Design for All approach in products, goods and services – Extending the range of users, [Web Link](#).
- 6) Guidance Note: Pedestrian Crossings at Bus Stop Bypasses, published by Transport for London, 2018, [Web Link](#).
- 7) Floating Bus Stop, published by the Cycling Embassy of Great Britain, [Web Link](#).
- 8) Building for Everyone: A Universal Design Approach, Booklet 1, External Environment, published by the National Disability Authority, [Web Link](#).
- 9) Traffic Signs Manual, published by the Department of Transport, [Web Link](#).
- 10) Accessible Public Realm, Updating Guidance and Further Research, published by P. Barnham Freelance Consulting on behalf of Transport for London, 2020, [Web Link](#).

6. CLARIFICATION OF TERMS AND ACRONYMS

Belisha Beacon: A Belisha beacon is an amber coloured globe lamp atop a tall black and white pole, marking pedestrian crossings. Two lights are usually provided on each side of the crossing, with the lights continuously flashing to provide additional visibility to zebra crossings.

Controlled Crossing: A controlled crossing is where the pedestrian can establish priority over vehicular traffic. Examples are signalised pedestrian crossings, zebra crossings and pelican crossings. L-shaped, red blister tactile surfacing is provided at controlled crossings.

C2CC Project: Clontarf to City Centre Project

DMURS: Design Manual for Urban Roads and Streets

Ladder Tactile Paving: Where a cycle track and footpath are at the same level, UK guidance recommends that ladder tactile paving is provided at the start of footpath to guide visually impaired users. Ladder tactile paving has raised bars running perpendicular to the direction of travel of the pedestrian.

NTA: National Transport Authority

Shared Space: Shared space is an urban design approach that minimises the segregation between modes of road user. The National Cycle Manual recommends that shared space between pedestrians and cyclists should be avoided in urban areas as far as possible.

S2S: Sutton to Sandycove Cycle Scheme

Tramline Tactile Paving: Where a cycle track and footpath are at the same level, tramline tactile paving is required on the cycle track in order to advise visually impaired people of the existence of the cycle track. Tramline tactile paving has raised bars running in parallel to the cycle track at a height of about 5 millimetres. Extended lengths of tramline tactile paving can sometimes cause problems for cyclists when bicycle wheels slip between the raised strips.

Uncontrolled Crossing: An uncontrolled crossing is where the pedestrian does not have priority over vehicular traffic. Buff-coloured, rectangular shaped, blister tactile surfacing is provided at uncontrolled crossings.

Zebra Crossing: A zebra crossing facilitates pedestrians to cross a road. It is identified by black and white 'zebra' road markings and a flashing orange beacon. Pedestrians have priority over vehicles at zebra crossings.