

CUENCA 2020

BICYCLE INTERSECTION PEER REVIEW

December 2020

On behalf of



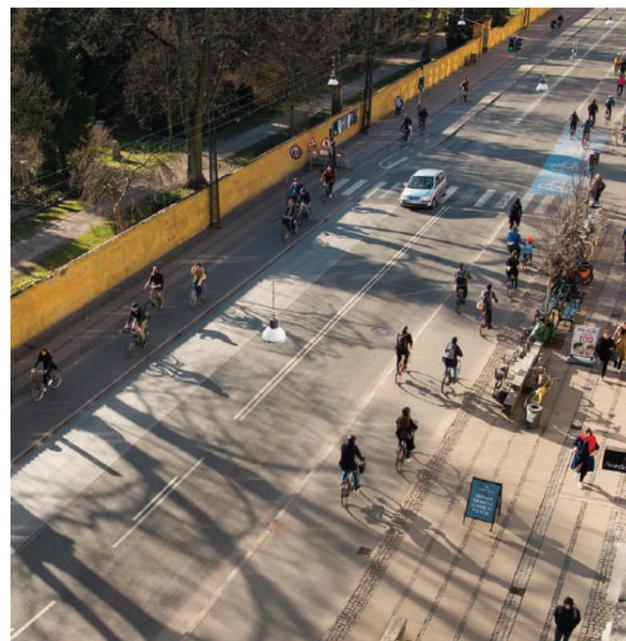


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Copenhagenize Design Company is a leading urban design & communications consultancy specialising in all matters relating to bicycle culture: planning, infrastructure, design and communications. When it comes to urban cycling and life-sized cities, we approach every job from a human perspective - using design, anthropology, sociology and rationality as our points of departure.

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INTRODUCTION

In response to the Cuenca's recent focus on cycling triggered by the COVID-19 pandemic, the City saw an opportunity to plan a comprehensive expansion of their bicycle infrastructure. Working in partnership with the Municipality, and the German Development Agency (GIZ), the Copenhagenize Design Co. team has consulted on four crucial intersections, bringing a user experience perspective to the design process. The initiative sprang up out of the international TUMI Challenge initiative, in which cities from around the world are tackling the global pandemic on a local scale.

This document is intended to guide the Municipality of Cuenca in the rollout of a more bicycle friendly city. And while this document focuses on four individual intersections, it is intended to offer replicable solutions that can be partly recreated across many scenarios. In order to best achieve this, the following document begins by addressing more high level suggestions before narrowing into the four intersections in questions with more detailed recommendations.



Photo Source: Municipio de Cuenca

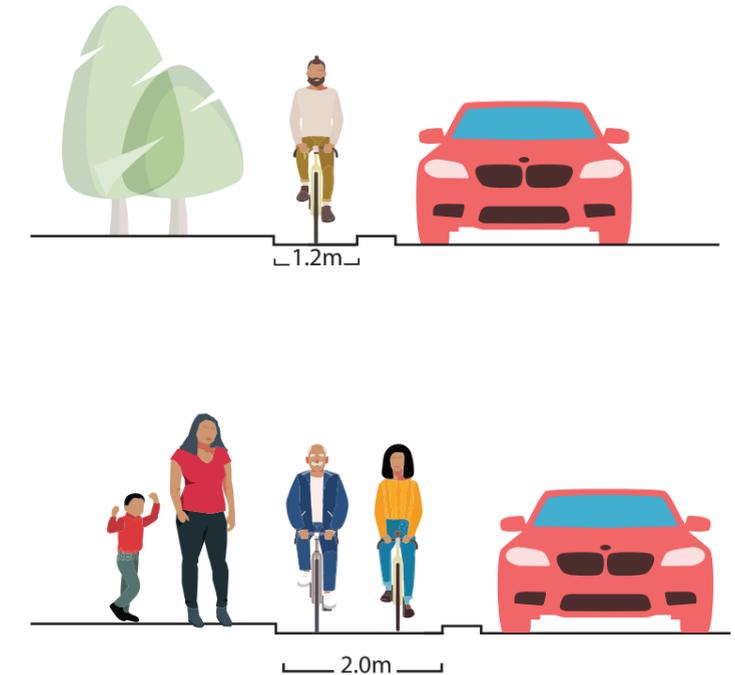
GENERAL RECOMMENDATIONS

BICYCLE LANE WIDTHS

Existing plans in Cuenca have designated bicycle lanes at a standard width of 1.2 metres. However, at this width, the planned lanes will provide neither a safe, nor comfortable experience for cyclists of all ages and abilities.

Looking to international best practice, a standard width of 2.0 metres should be applied, with an absolute minimum width of 1.7 metres only when necessary. At 2.0 metres, bicycle riders will be free to pass one another at a safe and comfortable distance while also allowing room to avoid small obstructions in the bicycle lane (ie sticks, stones, potholes etc.). Furthermore, providing 'passable' bicycle lanes reduces the tendency of faster bicycle riders to use the car lane.

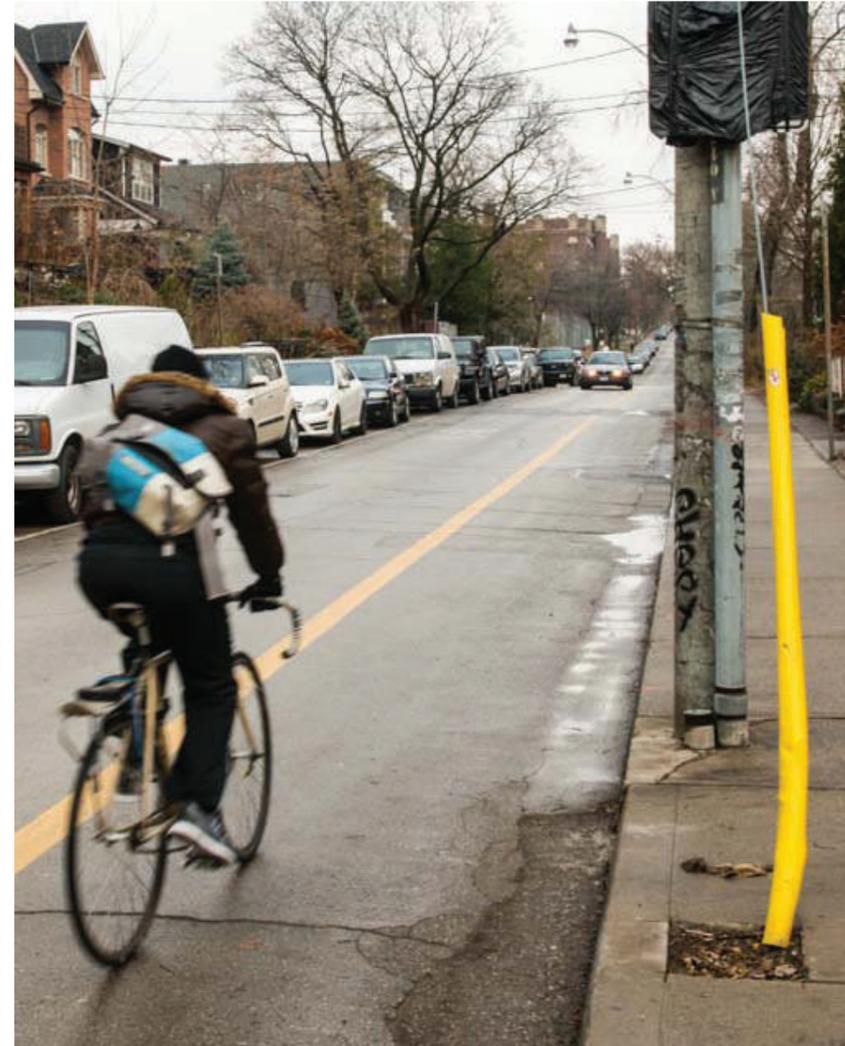
While the minimum recommended width of 1.7 metres follows Danish and Dutch standards, the standard operating width of 2.0 metres follows NACTO Urban Bikeway Design Guidelines. In all cases these guidelines work with a physical vehicle width of .7 metres and a minimum operating width of 1.0 metre.



2.0m wide bicycle lanes allow for riders to pass one another relatively comfortably

CONTRA-FLOW BIKE LANES

Contra-flow bicycle lanes are designed to allow bicyclists to ride in the opposite direction of motorists along conventional one-way streets. Though the street remains one-way for motorized vehicles, contra-flow bike lanes offer a two-way street for cyclists: one direction for motor vehicles and bikes, and the other for bikes only. It is important to underline that contraflow bike lanes are not bidirectional bike lanes, as each bicycle lane runs along opposite sides of the street.

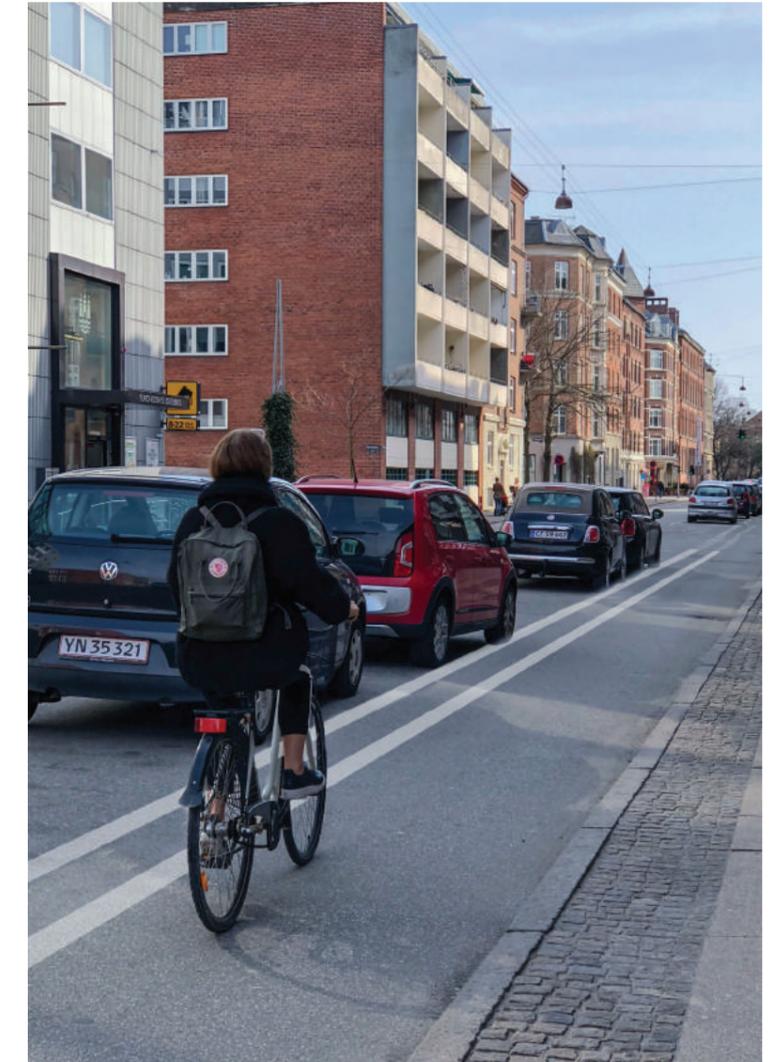


A contra-flow bicycle lane in Toronto facilitates bicycle flow . Source: Torontoist.com

PAINTED BICYCLE LANES

Painted bicycle lanes act as appropriate on-street bicycle facilities only under certain circumstances. When streets have slower vehicle speeds or witnesses relatively light daily traffic, this type of bicycle lane can offer adequate protection. Painted lanes can also be effective when used to connect cycle tracks through narrower stretches for a short distance where road width does not allow for full physical protection.

Painted lanes should be marked with a 10 cm wide thermoplastic dividing line. When appropriate, a 'dooring-zone' buffer of 30 to 60 cm should be placed between vehicles and painted bicycle lanes. Sewer drains, gutter seams, and utility covers should be level with the bike lane surface and oriented to prevent bicycle tires from getting stuck. As with cycle tracks, painted bicycle lanes should always run directly adjacent to the sidewalk on the right side of the street, with the existing sidewalk curb as a physical separation between bicycle users and pedestrians. It is important to keep in mind that given the lack of physical protection offered by painted bicycle lanes, traffic calming techniques can be implemented along the corridor to keep vehicle traffic slow.



SEPARATION TECHNIQUES

PARKING PROTECTION

Parallel car parking placed between motorised traffic and the bicycle lane can heighten the level of perceived and real protection for bicycle users. Parked cars should be further separated from the bicycle lane with some physical element that makes it clear where the cars are supposed to park. Without a physical element like a curb or bollards, cars often park too close to the edge of the lane, narrowing the safe space to cycle or blocking it completely. It is recommended to aim for a parallel parking orientation when separating bicycle lanes with parked vehicles, as angled parking can often create the added danger of vehicles driving into the bicycle lane, either blocking the space or injuring a bicycle user.



MODULAR CURBS

A relatively inexpensive and quick solution, modular curbs provide simple physical separation between motorised vehicles and bicycles. Like bollards, these curbs are well suited for early phasing of cycle track separation and temporary pilot projects. However, without sufficient height, cars can easily mount these barriers. Modular curbs are also to be spaced out to sufficiently allow bicycle users to enter and exit as needed and allow for emergency vehicles to mount when necessary. When space allows, modular curbs should be placed within a buffer zone of 30-60 cm.



CONCRETE CURBS

Curb separated cycle tracks are an intuitive and safe choice, that aesthetically fit with the surrounding streetscape and a strong level of protection for bicycle users. When implementing curb separated cycle tracks, offer frequent gaps to allow users to enter and exit midblock. Motorists also find curbs helpful during parking, as they provide a familiar edge to on-street parking. When space allows, modular curbs should be placed within a buffer zone of 30-60 cm.



RAISED CYCLE TRACKS

A curb separated, raised cycle track provides a very effective separation from both motorised traffic and parked vehicles. For motorists looking to park, the curb offers a clear distinction of where on street parking should take place. For bicycle users, they are placed on a higher grade than the road, thus making them more visible to motorists while also being well protected by the concrete curb. When implementing this style of bicycle lane, keep in mind the need for retrofitting stormwater drainage and other existing utility covers, and consider adding in the occasional tree or planting bay for additional separation and street greening. The vertical separation reduces the need for a further horizontal buffer.



INTERSECTION MARKINGS

Reliable, intuitive and consistent road markings are an integral component of intersections no matter the shape or size. Road markings guide the behaviour of all road users at intersections while increasing visibility of all modes, and especially the vulnerable — those walking and cycling. Consistent application of colour, size and shape for road markings across a bikeway corridor is important to ensure the intersections are easily understandable to all road users.

STOP LINES

At signalised intersections, setting the stop line for motorists behind the stop line for bicycles makes vulnerable users more visible to motorists. Furthermore, these setback stop lines generally make it easier for motorists to see crossing pedestrians. This is especially critical for transport truck drivers. Coupled with a leading cyclist interval (see Signal Phasing) , this design element is effective at avoiding the all too common 'right hook' scenario. One Danish study has found a 35% decrease in the number of collisions between right turning motorists and bicycle users continuing straight, and a 50% drop in cyclist casualties. As a relatively simple and affordable design solution, setback stop lines also do not generally reduce car capacity at the given intersection.



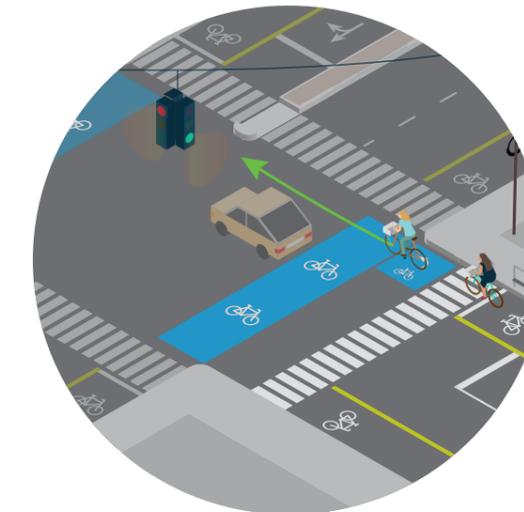
Set-back stop lines in Copenhagen have been found to significantly increase the safety of intersections. Source: Copenhagenize

BOX-LEFT TURNS

Left turns are one of the more dangerous maneuvers for bicycle riders, particularly when expected to follow the path of a left turning motorized vehicle, or the "vehicular left". The so-called 'box-left' turn for bicycle users is a much safer alternative to the vehicular left turn that places the bicycle rider in the leftmost traffic lane waiting for a break in oncoming motorised traffic. Accommodating the box-left with a marked and designated waiting left turn box can help ensure this relatively underused practice becomes more common. Box-left turn boxes have been implemented in a number of cities around the world as they become more bicycle-friendly, from Vancouver to Amsterdam. These thermoplast boxes can also be accompanied by signage clarifying the maneuver.



1
The cyclists continues through with a green light, stopping at the opposite corner.



2
With the change of signal, the cyclist then completes the left turn maneuver.

BICYCLE CROSSINGS

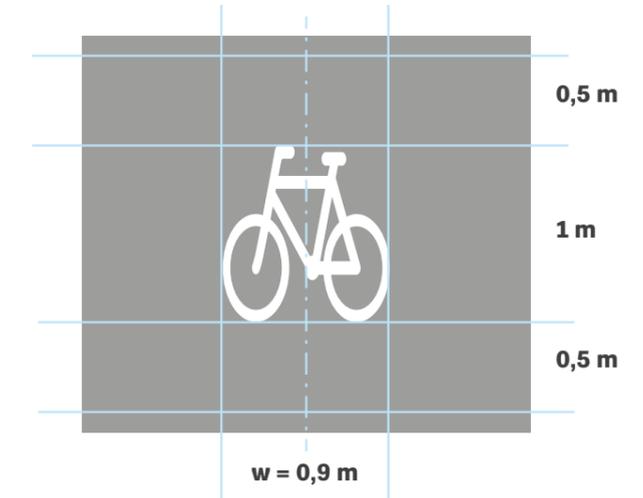
Just as pedestrians are best served with clearly marked crosswalks, so too are cyclists. Marked in coloured thermoplast, these crossings are a visual cue to drivers to watch for bicycle riders. In more complex or distorted intersections, they are also useful in guiding bicycle users along the correct pathway. Furthermore, these markings reinforce that bicycle users have priority over turning vehicles. Restraint should be exercised in introducing these crossings, as studies have shown that while one or two crossings can reduce injuries by 19%, three or more crossings can have a negative impact on intersection safety.



In Copenhagen blue thermoplastic paint alerts motorists where to expect cyclists.

PICTOGRAMS & MATERIALS

Bicycle pictograms can be used to further clarify the space designated for bicycle users through intersections. This measure helps draw motorists' attention to where bicycle users will likely ride. Pictograms should be placed on the lead-up to the intersection in the bicycle lane, through the intersection, and in the catchment in the bicycle lane on the opposite side of the intersection. On corridors, pictograms should be applied every 100 metres. White thermoplastic road marking paint, a popular, durable pavement marking, is the industry standard for pictograms, crossings and all other kinds of road markings. Thermoplastic can be formed into specific shapes such as bicycle pictograms, arrows, and rumble strips. The material offers relatively low-cost investments, cures quickly, lasts long, and is easy to make spot repairs. The effectiveness of road markings depend entirely on their visibility and for this reason maintaining markings with a long life and durability should be a priority.



The pictogram can change in size while maintaining its proportions.



A municipal worker in Copenhagen applies a fresh coat of thermoplastic paint.

INTERSECTION ENHANCEMENTS

BICYCLE SIGNALS

With the standard three-lens signal heads of red, amber, and green lights, dedicated bicycle signals closer resemble motor vehicle signals than pedestrian signals. Given this similarity, dedicated bicycle signals should be clearly marked with signage to avoid confusion among all road users. Often, the lenses either appear in the shape of a bicycle to ensure clarity or are smaller in size. Bicycle signals should be clearly visible to the bicycle rider, placed on either side of the intersection, with near-sided signals located closer to bicyclists eye level and by using, smaller, 10 cm lenses.

SIGNAL PHASING

Signals should recognise users of all ages and abilities by providing longer green time through intersections for vulnerable users. Determining phase minimum durations should take into account the crossing time for slower, less experienced users. Bicycle signals are generally installed with a dedicated priority phase, giving people cycling a head start through the intersection before automobile traffic. A five second pre-green for bicycle users (a Leading Bicycle Interval), has users enter the intersection before motorists, increasing visibility and in turn, safety. At the end of the phase, there is generally a five second post-green for motorists to complete their turn while bicycle users are faced with a red bicycle signal.

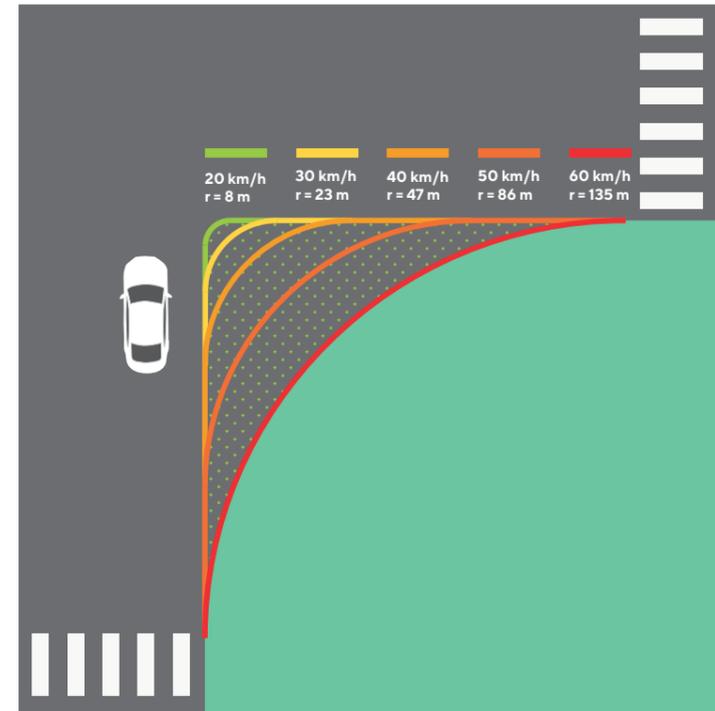
Bicycle traffic signals accommodate safer crossings through intersections, especially through large, complicated and dangerous junctions, and can be timed to facilitate a smoother flow through the network. These light phases should continue passively without requiring bicycle users or pedestrians to push a button to start the cycle.



Dedicated bicycle signals can provide a leading bicycle interval, making cyclists especially visible in the intersection.

CORNER CURB RADIUS

Reducing the radius of the corner curbs at an intersection slows down cars completing a turn. By slowing turning vehicles, crash rates at bicycle and pedestrian crossings are reduced. Throughout Copenhagen most corner curb radii are 4 metres or less at intersections.



REFUGE ISLANDS

Refuge islands create a two-stage crossing for pedestrians along wider arterial streets, effectively shortening the crossing time and thus reducing the time exposed to risk. Furthermore, refuge islands have a traffic calming effect, drawing motorist attention to space likely to be occupied by pedestrians. While refuge islands may be used on both wide and narrow streets, they are generally applied at locations where speeds and volumes make crossing intimidating. Refuge islands should include curbs and, in some cases, bollards for clear delineation. Studies have shown these simple treatments decrease pedestrian-automobile collisions by 40% on streets without crossing facilities beforehand.

CROSSWALKS

Pedestrian crossings should be placed at each corner of the intersection as well as at strategic mid-block locations. Locating mid-block crossings at destinations such as mid-block bus stops, transit stations, parks, plazas, and other major destinations should be standard practice. The design should take into account both the current and the projected crossing demand at peak season (often if located by a school or university).

1 BICYCLE CROSSINGS

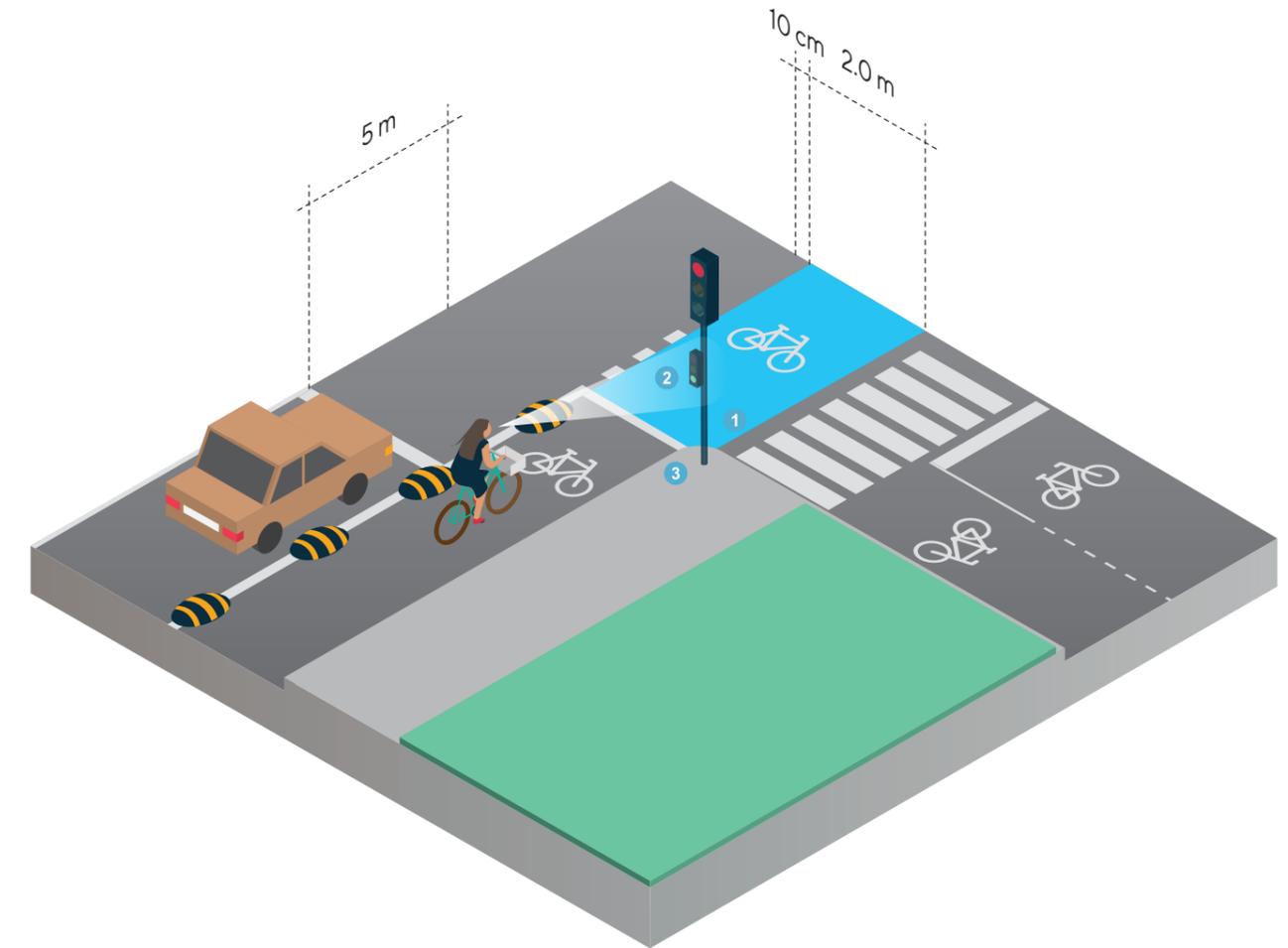
- » Should span the entire width of the bike path.
- » Demarcated by a 10 cm wide white dotted line halfway through intersection.

2 PULLED BACK STOP LINES

- » Place 5 metres behind cycle stop line

3 BICYCLE SIGNALS

Place in eye sight of cyclist, minimum 2.2 metres above sidewalk, measured from bottom of signal
 Use 10 cm lenses
 Place 30 cm from curb, on near corner



BUS ISLANDS

Bus island designs allow passengers to get on or off the bus without immediately crossing bicycle traffic, but rather a platform dedicated to passengers. The length of the island should be at least equal to the length of one bus, but longer if implemented at a busy bus stop. On both the island and the sidewalk, accessibility ramps facilitate entrance and exit. Ensure the ramp does not protrude into the bicycle track in order to avoid dangerous passage for bicycle users. Ideally, the bus island should also be equipped with a detectable surface for the visually impaired.



A bus island in Copenhagen facilitates passenger and cyclist flow

BICYCLE PARKING

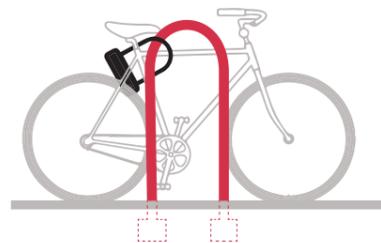
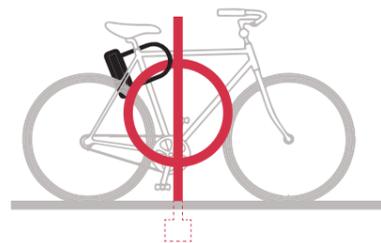
To increase ridership, bicycle parking must cater to bicycle users' habits and needs: by making it easy, safe, and convenient to leave your bike at locations for either a short or longer duration.

When planning for bicycle parking, there is a key distinction between the style and location of parking depending on if it is for short-term or long-term use. Short-term parking should cater to destinations where users do not stay for long durations, for example shops, eateries and most commercial/retail locations. Long term parking should be found at places where bicycles might stay for hours or potentially overnight, including office buildings, schools and universities, workplaces and train stations. Long-term parking can be placed both outdoors and indoors, particularly for workplaces and residences. Protected outdoor parking – defined by structures that cover at least three sides and include a roof – keep bicycles covered from the elements. All bicycle racks used for both short and long-term parking should be secure and simple to use and should not require any previous know-how or guide for using it.



BICYCLE PARKING DESIGN

Bicycle parking should be simple and intuitive to use. Good bike parking design can empower people to spend less time figuring out how to lock up and more time getting on with their day. Complex bicycle parking systems and parking that requires lifting or raising a heavy bicycle discourage people from seeing their bike as a convenient tool. The best bicycle rack designs provide upright support, are strong and are long-lasting. Two types of racks that have been successful globally are butterfly racks, ideal for indoor parking where building security minimises theft, and single hoop/U-racks.



To prioritize usability, keep rack design simple

BICYCLE PARKING SITING

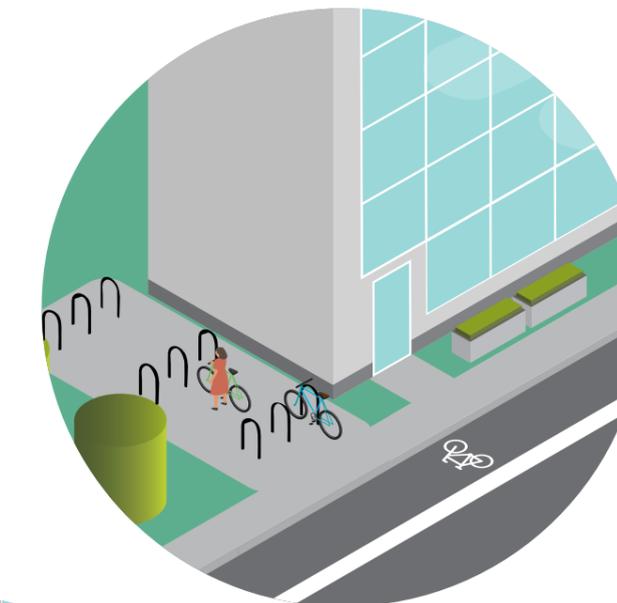
For all types of bicycle parking solutions, location and placement is an absolute priority. Bicycle racks in a hard-to-find location or too far from their destinations will not be well used. When siting bicycle parking, it is important to recognise the behaviour and preference of the user. One important factor is proximity to the final destination. For instance, someone making a quick stop at a store to buy items will park very close to the door. On the other hand, someone parking their bike over the weekend would be more willing to park a little bit further from their end destination *if* there's an added sense of security (ie covered or even indoor racks).

BICYCLE PARKINGS SHOULD BE LOCATED:

- Near the access routes to destinations: "in the flow" of the access routes.
- Near building or transit entrances.
- Within view of local residents and commerce with high visibility.
- On the ground floor level, not in a basement.
- Where it has barrier free access, easily accessible for people of different physical abilities, with different bicycle types.
- With easy in and easy out access for bicycle users
- With signage guiding users to interior parking.



1 For short term destinations such as a store, bicycle parking should be close to the doorway and visible.



2 For medium term destinations, parking should be accessible and directly visible on the approach.



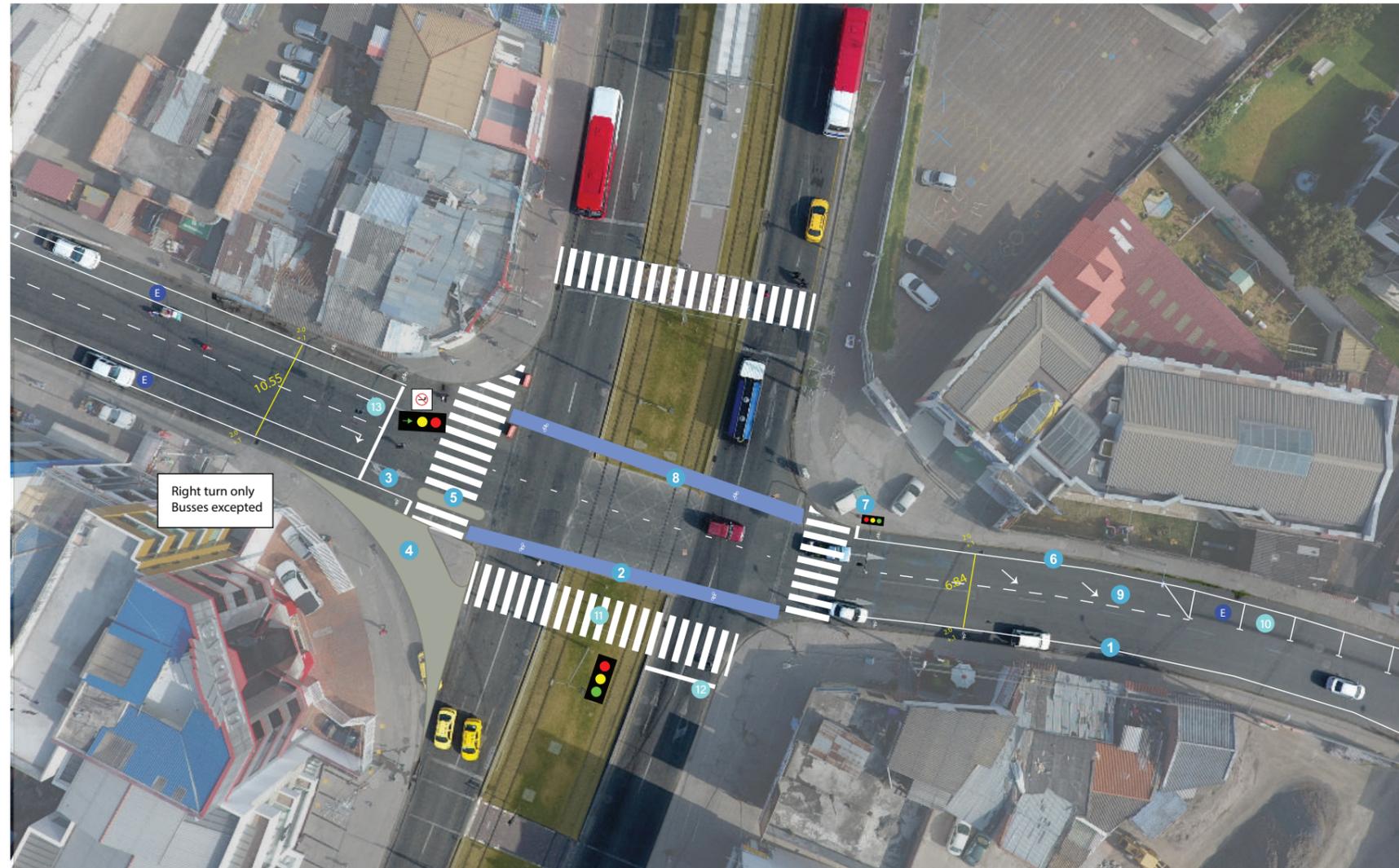
3 For longer term destinations, bicycle parking facilities should be covered, reliable, and maintained.

AV. DE LAS AMÉRICAS Y CALLE DEL BATAN

The intersection of Avenida de las Americas and Calle del Batan/Avenida Gral. Escandón presents a situation in which a large transit-oriented corridor intersects with a smaller one-way collector street. Calle de Batan/Avenida Gral. Escandón are planned to be an important component of an east west cycling corridor in the city. There are no plans at the present time to introduce cycling infrastructure along Avenida de las Americas. As a result, the role of this intersection will be to safely move cycle traffic along the east/west axis. The nearby El Arenal market is a significant destination and generator of traffic congestion.

The most evident points of conflict include the potential collisions between the diverse transport modes and users, and congestion created by the nearby market. The recommended solutions include mitigating the dangers of right turn slip lane, introducing a contraflow bicycle lane, and establishing phased signals, all of which being elements that can be replicated in other intersections.





SHORT TERM

- 1 Introduce a 2.0 metre, grade separated, parking protected bicycle lane running eastbound on Escandon and El Batan, with a separation of 0.1 m and on-street pictograms
- 2 Implement a coloured bicycle crossing to safely accommodated eastbound bicycle traffic through the intersection
- 3 Pull back stop line for motorized vehicles to prioritize cyclists and increase visibility
- 4 Expand the sidewalk by filling in the existing slip right lane, requiring motorized vehicles to take right turns more slowly while granting more space to pedestrians.
- 5 Implement a small refuge island to facilitate pedestrian crossing while further protecting bicycle riders from right turning southbound motorists.

LONG TERM

- 6 Introduce a 2.0 m grade separated contraflow bicycle lane running westbound along Escandon and El Batan, with a separation of 0.1m and on-street pictograms
- 7 Install a dedicated bicycle signal for the westbound bicycle traffic travelling from El Batan to Escandon
- 8 Implement a coloured bicycle crossing to safely accommodated westbound bicycle traffic through the intersection
- 9 Merge eastbound motorized traffic on El Batan into one lane
- 10 Replace northern lane of traffic with on street parallel parking, protecting the westbound bicycle lane
- 11 Relocate the existing pedestrian crossing in line with the sidewalk to create easier and more intuitive pedestrian flows
- 12 Relocate the stop line and signals for motorized vehicles up to the pedestrian crossing
- 13 Introduce clear signalling and signage restricting illegal left turns from Escandon onto Av. de las Americas



SHORT TERM

- 1 Convert Barrial Blanco into a one-way south-westbound street
- 2 Introduce 2m physically protected contraflow bike lanes on Barrial Blanco, with a separation of 0.1m and pictograms
- 3 Move parking away from the sidewalk on Barrial Blanco to create a parking-protected bicycle lane. Add a buffer space between the parking and the cycle lane, delineated using thermoplast and modular curb.
- 4 Use thermoplastic pictograms on El Rollo to alert westbound traffic that this is a mixed use road
- 5 Introduce signage exempting bicycle riders from one-way restrictions
- 6 Create a physically protected contraflow bike path running eastbound on Del Rollo with thermoplastic pictograms
- 7 Introduce a 2m protected bicycle lane going southbound on Heroes de Verdeloma, with separation of 0.1m and pictograms
- 8 Introduce a 2.0m protected bike lane going northbound on Heroes de Verdeloma, with separation of 0.1m and pictograms
- 9 Implement an eastbound and westbound coloured bicycle crossing to safely accommodate bicycle traffic through the intersection
- 10 Instal left turn boxes for cyclists turning left on all four corners of the intersection
- 11 Pull back stop line for motorized vehicles to prioritize cyclists and increase visibility on all signalized stops around the intersection
- 12 Implement a small refuge island on the zebra crossing to facilitate pedestrian crossing

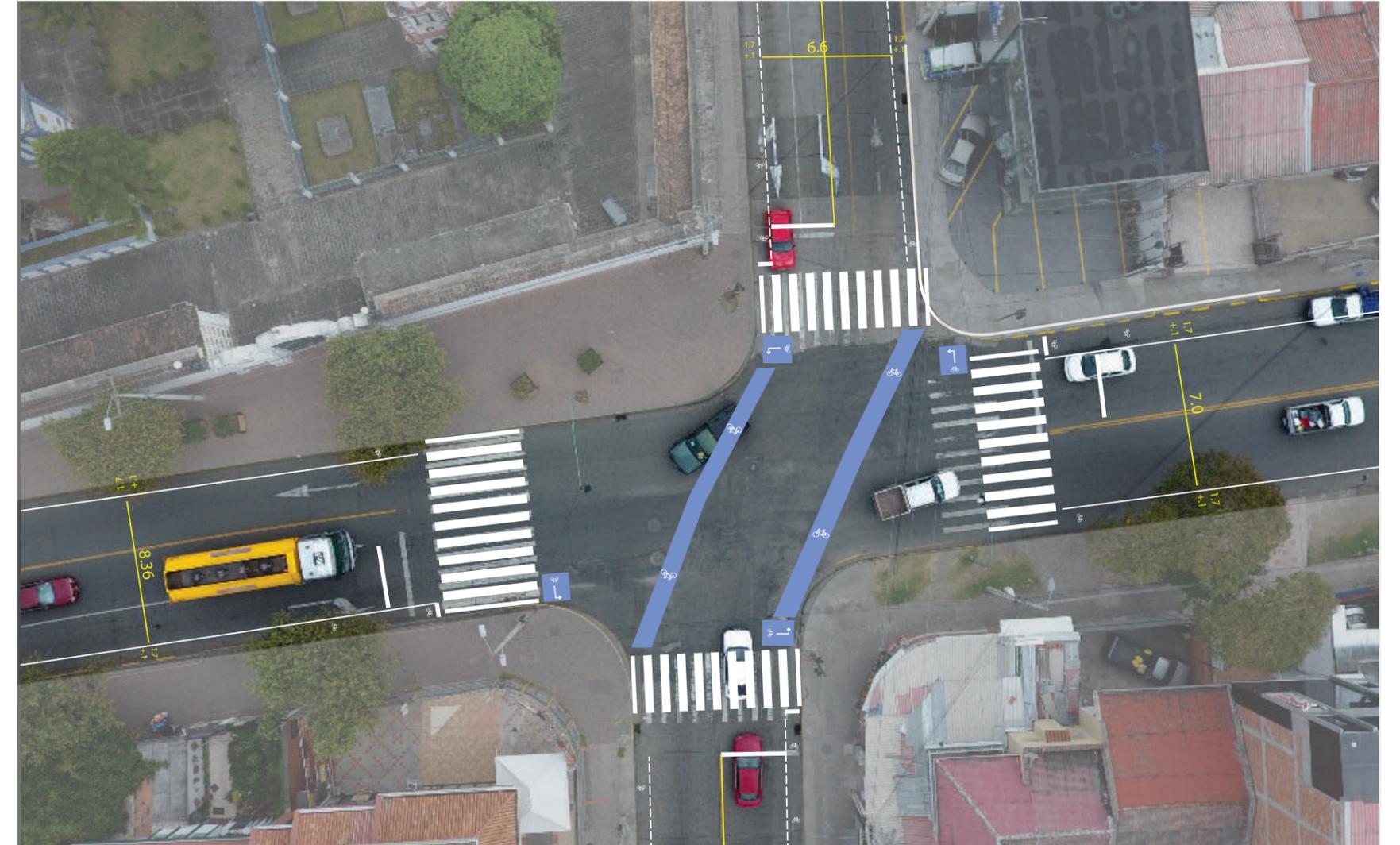
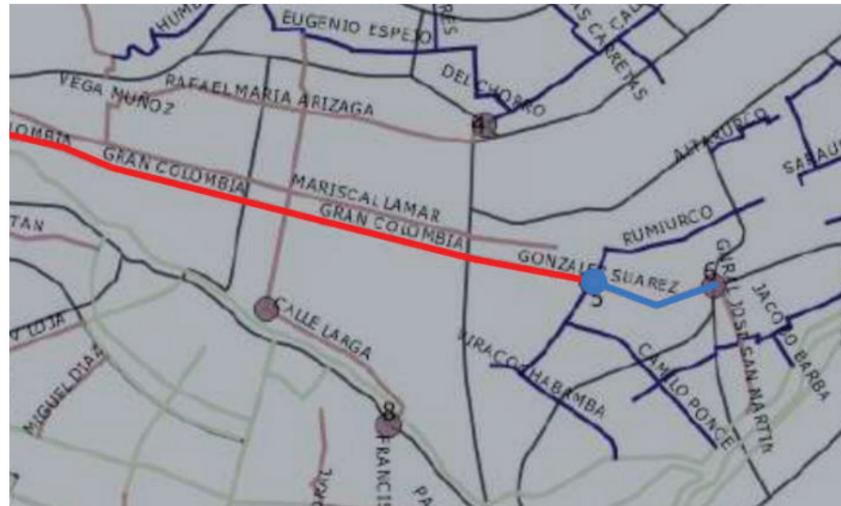
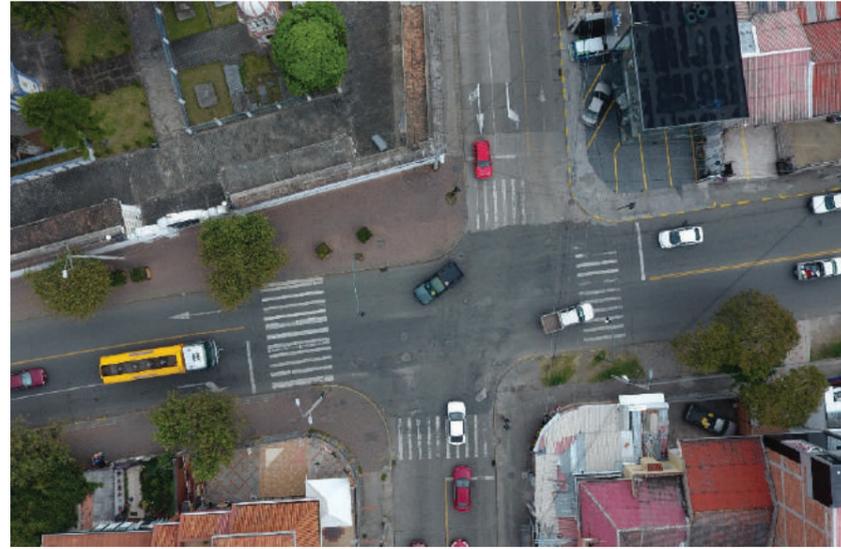
LONG TERM

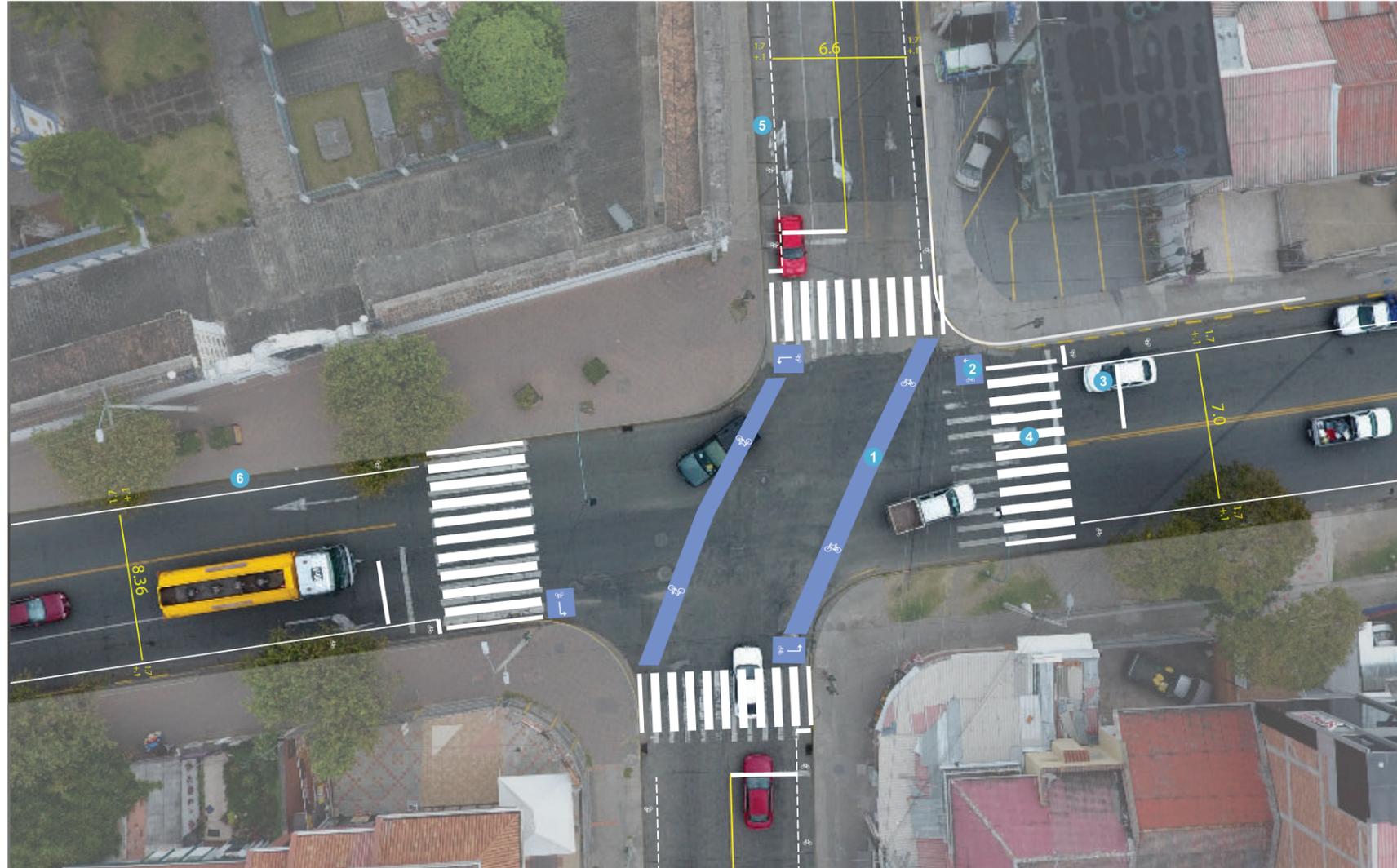
- 13 Convert Calle Vieja into a one-way eastbound street (Long Term)
- 14 Extend the green boulevard on Heroes de Verdeloma to provide additional pedestrian protection and dissuade motorists from making illegal turns
- 15 Introduce an unsignalized zebra pedestrian crossing complete with boulevard refuge island
- 16 On either side of the new pedestrian crossing (#14), introduce "yield markings" to alert cyclists and motorists of the pedestrian crossing.
- 17 Create a bus island between the bus and the bike path to create refuge for those exiting the bus. Thermoplastic rumble strips on the approach help alert bicycle riders of upcoming yield.
- 18 Implement a small refuge island on the zebra crossing to facilitate pedestrian crossing
- 19 Introduce an unsignalised zebra pedestrian crossing on Calle Vieja
- 20 Link the bicycle lanes on Heroes de Verdeloma with a coloured bicycle crossing with pictograms to safely accommodate bicycle traffic through the intersection

GONZALEZ SUAREZ Y GUAPONDELIG

The intersection of Avenida Gonzalez Suarez and Avenida Guapondelig represents a rather standard four-way intersection typology. Both Gonzalez Suarez and Guapondelig are planned to be important corridors in Cuenca's expanding bicycle network.

The largest barriers to introducing safe cycling infrastructure at this intersection is a narrow right of way, a slightly offset intersection, and high levels of automobile and bus traffic. Though the offset nature sets this intersection apart from other more straight forward crossings, the solutions can be applied around Cuenca. Recommendations include introducing left-turn boxes, bright and clear bicycle crossings, and pulled back stop lines. All recommended changes to this intersection should be carried out in unison. All recommended changes to this intersection should be carried out in unison.



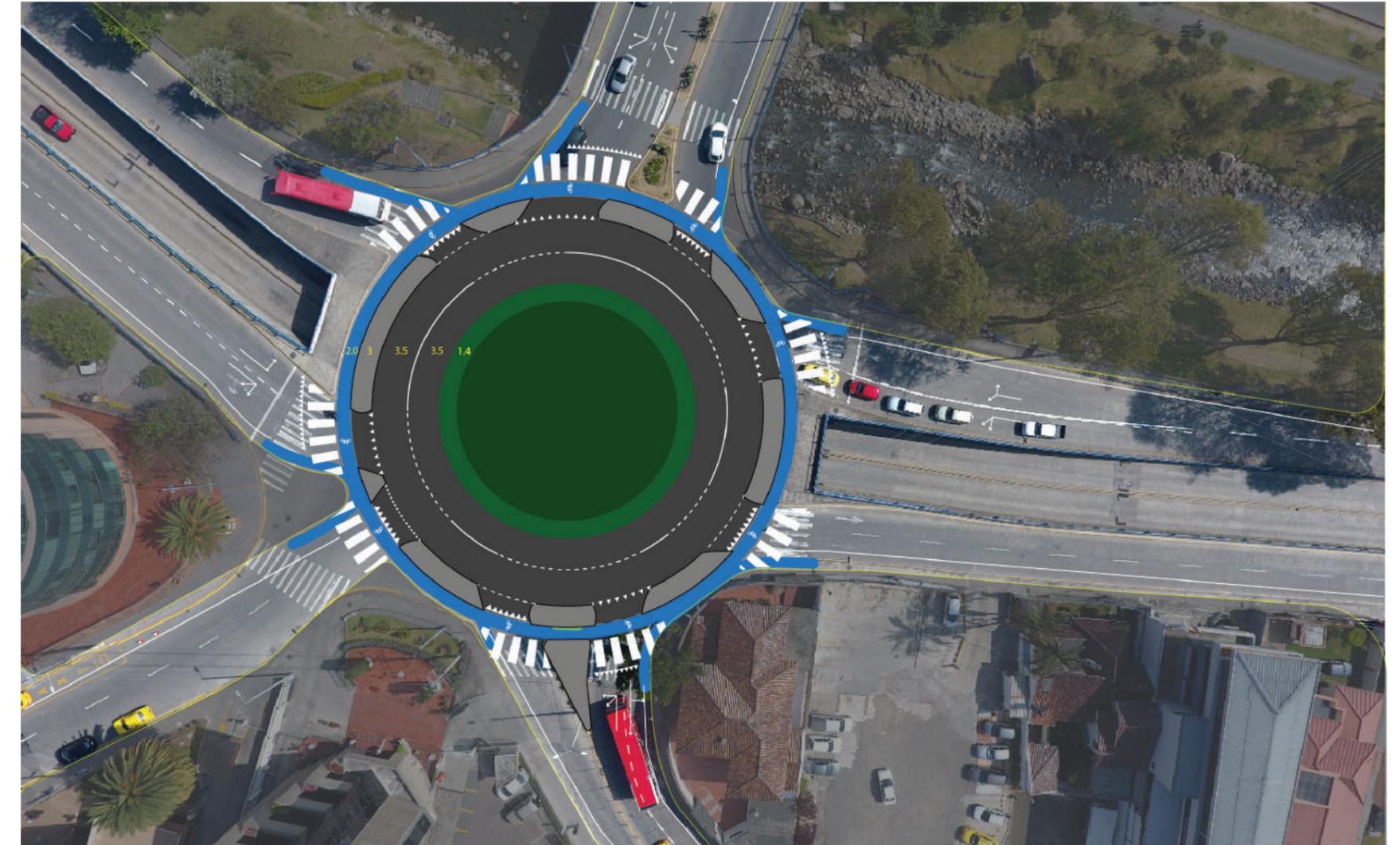


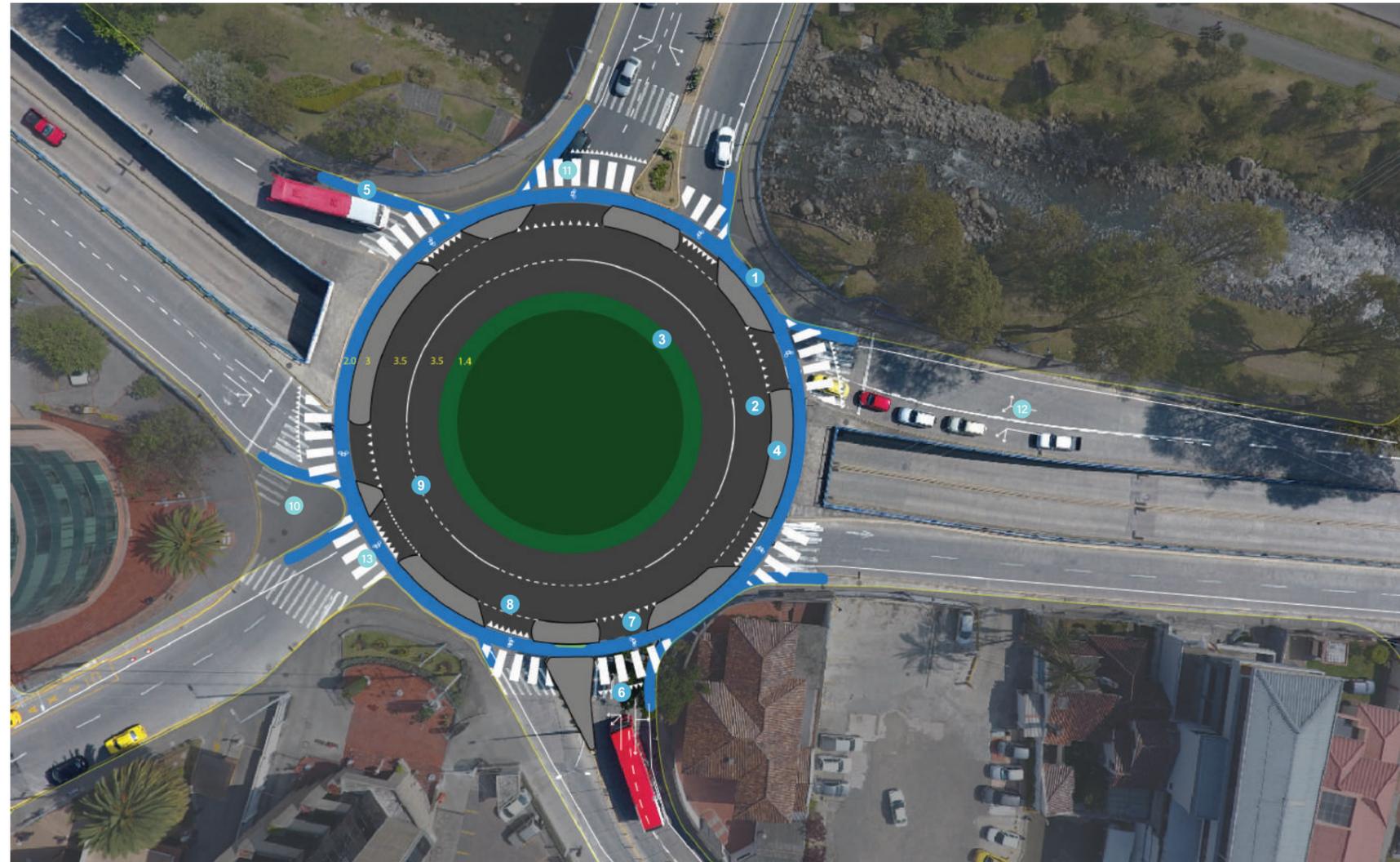
- 1 Implement coloured bicycle crossing to safely accommodate bicycle traffic through the intersection
- 2 Introduce left turn boxes for cyclists turning left on all four corners of the intersection
- 3 Pull back stop line for motorized vehicles to prioritize bicycle riders and increase visibility
- 4 Ensure pedestrian crossings are clearly marked
- 5 Introduce unidirectional painted bicycle lanes on Guapondelig of 1.7 metres, with a 0.1 metre protection and pictograms.
- 6 Implement protected unidirectional bicycle lanes on Gonzalez Suarez of 1.7 metres with a 0.1 metre protection and pictograms.

TODO LOS SANTOS, PAUCARBAMBA Y 12 DE ABRIL

The roundabout serving Avenida 12 de Abril, Bajada de Todos los Santos, Paucarbamba, and Avenida Jose Peralta is a sprawling and complex five point intersection that prioritizes the motorized vehicle over all other modes of transport.

This complex roundabout is a meeting point for several important corridors and serves as a primary entry route into the city centre. Puente de Todo los Santos connects the network to the city center and Paucarbamba is a direct route to the University of Cuenca. It was vital to present solutions for one roundabout, as Cuenca's road network is strung together by multiple large roundabouts, which are rarely accommodating to bicycle riders. The proposed rearrangement of the roundabout has reprioritized the various users of the intersection, putting bicycle riders and pedestrians first. Recommendations feature an overall tightening of space for motorized vehicles, buffers between bicycle riders and motorists, and more direct pedestrian pathways. All recommended changes to this intersection should be carried out in unison.





- 1 Introduce a 2.0 metre bike lane around the outer-perimeter of the roundabout. The bicycle lane in the roundabout should be a bright blue thermoplastic strip with clear pictograms, which will increase rider visibility.
- 2 Limit the space for cars to two clearly demarcated lanes of 3.5 metres
- 3 Enlarge the area of the innermost green circle by a radius of 1.4 metres
- 4 At all points that are not entering or exiting points, install buffers of three metres between the cycle lane and the outermost car lane. It is recommended that these buffers are either raised curbs or traffic islands.
- 5 Connect the roundabout cycle lane to the entering and exiting bicycle lanes with bright blue thermoplastic strips.
- 6 Paint yield lines or "shark teeth" on all entrance points of the outermost car lane, to ensure that cars yield to other cars when entering the roundabout
- 7 Paint "shark teeth" at every entrance point behind the pedestrian zebra crossings, to ensure that motorists and bicycle riders yield to pedestrians before entering the roundabout
- 8 Paint "shark teeth" at every exit point behind the bicycle lane to ensure that motorists yield for riders
- 9 The painted line between the innermost and outermost car

lane should become a dashed separation for every entrance and exit point.

- 10 Pull out the curbs between Av. 12 de Abril and Av. Jose Peralta, and between Av. 12 and Paucarbamba
- 11 Reposition all pedestrian crossings so that they are directly behind the bicycle lane, and as convenient and clear as possible.
- 12 Paint on-street road markings that direct motorists into the correct roundabout lane
- 13 Make all exit roads one way lanes for motorized vehicles.

LIST OF SUPPLIERS

TOOL	SUPPLIER NAME	LOCATION
Bicycle signals	Dialight	Asia
	Swarco	North America
Intersection Road Markings	Ennis-Flint	Global
	Middle East Road Marking	Middle East
	REDA Group	EU& Middle East
	Geveko	Global
Pedestrian Enhancements	BMC Gulf	Middle East
	Specom	North America & EU
	Marcal	EU
	Tactile Paving Services	EU & UK

SUPPLIER WEBSITE	NOTES
http://www.dialightsignalsandcomponents.com/Product/Category/traffic	10 and 15 cm traffic module options
https://www.swarco.com/solutions/traffic-management/bicycle-solutions	
https://www.ennisflintemea.com/	Specialize in road markers along and thermoplast along with other bike products
http://meroadmarking.com/	Streetbond project product can be used on asphalt and concrete surfaces
http://redanational.com/about-us/	Color-Safe® Methyl Methacrylate (MMA) resin for a variety of exterior uses
https://www.geveko-markings.com/	Thermoplast with anti-skid properties
https://bmc-gulf.com/products/access-tiles-tactile-tiles/	Tactile paving
http://specom.co/tactile/	Metal spots and tactile indicators
https://www.marcal.fr/cedo	
http://www.tactilepaving.co.uk/	Metal spots fully compliant to the building regulations and the Disability Discrimination Act

TOOL	SUPPLIER NAME	LOCATION
Protected Bicycle Lanes	Sino Concept	Middle East
	Varley and Gulliver Ltd	EU
	Unilock	Global
	FAAC	Global
	SICLA	EU
Painted Bicycle Lanes	Swarco	Global
	Gaf	Global
	Transpo	North America
	Geveko	Global
Bus Stops	Real Ferro	Middle East
	Trueform	EU
	nonsoloarredo	EU

SUPPLIER WEBSITE	NOTES
https://www.sinoconcept.com/	bollards and site options
http://www.v-and-g.co.uk/	Cast aluminum bollards
https://commercial.unilock.com/contact-us/	Paving stones and walls
https://faacbollardae.com/	bollards
https://www.zicla.com/	Armadillos and planter separation
https://www.swarco.com/solutions/traffic-management/bicycle-solutions	Specialize in road markers along and thermoplast along
https://www.gaf.com/en-us/roofing-products/other-building-materials/pavement-coatings	Streetbond project product can be used on asphalt and concrete surfaces
https://www.transpo.com/roads-highways/safety-products/pavement-marking-material	Color-Safe® Methyl Methacrylate (MMA) resin for a variety of exterior uses
https://www.geveko-markings.com/	Thermoplast with anti-skid properties
https://www.realferro.com/bus-shelters.html	Available in a variety of lengths
https://trueform.co.uk/category/canopies-covered-walkways/	Custom bus stops available
https://nonsoloarredo.com/product/arredo-urbano/pensiline-per-autobus/sharp	Modern bus stop with advertising capabilities

TOOL	SUPPLIER NAME	LOCATION
Wayfinding	Modulex	Global
	Cosign	EU
	Modulex	Global
	Innerface Sign	North America
Bicycle Parking	Mister Shade Me	Middle East
	Urban Elements	EU
	Streetlife	Middle East/UK
	Cycle Hoop	EU

SUPPLIER WEBSITE	NOTES
https://www.modulex.com/custom-exterior-signage/	Custom exterior signage
http://www.cosign.be/	Custom exterior signage is available
https://www.modulex.com/products/	LED and typical wayfinding (also pedestrian /ADA wayfinding)
https://innerfacesign.com/portfolio-items/wayfinding/	
https://www.mistershademe.com/street-furniture-uae.html	Various Bike Parking & Site furniture options
https://urban-elements.dk/produkt-kategori/cykel-inventar/	
https://www.streetlife.nl/en/bins-bollards-bicycle-parking-pillars	
https://www.cyclehoop.com/product/access-infrastructure/bike-wheeling-ramp/	

TOOL	SUPPLIER NAME	LOCATION
Lighting	Luceco	Global
	Urban Elements	EU
	Trilux	North America
Miscellaneous	Huntco	North America
	Swarco	Global
	Eco Counter	EU & North America
	ITSTeknik	EU
	Mantis	EU & North America
	Falco	EU

SUPPLIER WEBSITE	NOTES
https://www.luceco.com/ae/product-type/exterior-commercial	
https://urban-elements.dk/produkt-kategori/belysning/pullert-og-mastebe-lysning/	
https://www.trilux.com/en/applications/outdoor/outdoor-lighting/cycle-paths-and-footpaths/	
https://huntco.com/bike-repair	Bike repair Stations
https://www.swarco.com/solutions/traffic-management/bicycle-solutions	Greenwave technology and bike counter
https://www.eco-compteur.com/en/home/	Bike pedestrian counter
http://www.bicyclecounter.dk/BicycleCounter/index.jsp	Bicycle Counter
https://www.mantis-stands.com/en/	bike pumps & repair stations
https://www.falco.co.uk/products/cycle-parking/advanced-cycle-products/velocomfort%C2%AE-automated-cycle-wheel-ramp.html	Have automatic and brush option for bike access stair ramps

TOOL	SUPPLIER NAME	LOCATION
	Orient Industrial	Global
	Multihog	EU
	Ventrac	North America

SUPPLIER WEBSITE	NOTES
https://www.mnsweeper.com/about-us_d1	Street Sweepers
https://www.multihog.com/applications/	Multiple options for snow, trees, grass, etc. removal on bike lanes
https://www.ventrac.com/solutions/snow	Sidewalk and bike lane snow removal, available at 86 cm widths

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