iRAP Star Ratings of NACTO-GDCI's Global Street Design Guide

Bloomberg Philanthropies

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INITIATIVE FOR GLOBAL ROAD SAFETY

NACTO

Global Designing Cities Initiative

iRAP

GRSF
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Document Contents

Introduction

About NACTO-GDCI

The Global Designing Cities Initiative (GDCI) is a program of the National Association of City Transportation Officials (NACTO), a non-profit organization that aims to inspire a shift towards safe, sustainable, and healthy cities through transforming our streets.

Who we are

The Global Designing Cities Initiative is a team of designers, planners, and urban strategists committed to working in support of city practitioners to get projects on the ground. We focus on empowering local officials and communities to become changemakers, equipping them with the knowledge, tools, and tactics needed to improve urban mobility and fundamentally change the role of streets in our cities. Our work is informed by the strategies and international best practices captured in the Global Street Design Guide.

What we do

- Policy and Design Guidance
- Capacity Building and Community Engagement
- Interventions and Transformations
- Metric Collection and Evaluation
- Scale Up Impact through City-wide Programs

How we work

Implement
We work with cities to design and implement projects that demonstrate what is possible.

Empower
We train professionals, agency staff, and academics to ensure they have the knowledge and tools to transform their streets.

Strategize
We help to develop and launch programs that ensure long term sustainability, support scale up, and ultimately get more projects on the ground.

Inspire
We support local officials on public engagement and strategic communication to build local support.

Embed
We advance efforts to update local policies, guidelines, and standards to align with those in the GSDG and other best practices.

The Global Designing Cities Initiative was created under the leadership of Michael Bloomberg and Janette Sadik-Khan within the Bloomberg Initiative for Global Road Safety

"City streets are at the center of so many big challenges facing the world, from health and safety to climate change. The guide is full of creative ways cities are reshaping streets to better serve the public—and if those ideas spread around the world, they can help improve billions of lives."

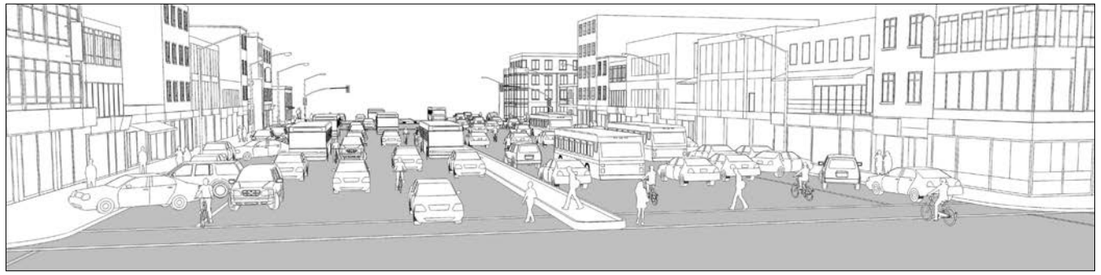
— Michael R. Bloomberg
Founder of Bloomberg Philanthropies and Former Mayor of New York City

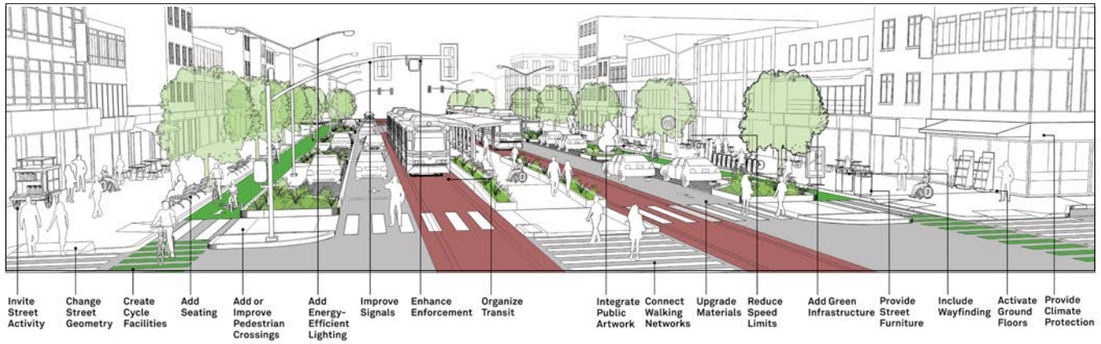
About the Global Street Design Guide

Created with the input of 72 cities and 42 countries, the Global Street Design Guide (GSDG) offers technical details to inform street design that prioritizes pedestrians, cyclists, and transit riders. The guide includes real-world examples of street and intersection transformations that improve road safety as well as the overall efficiency of urban streets.

Street design that prioritizes pedestrians, cyclists, and transit riders

The Global Street Design Guide invites cities to ask what's possible of their streets, encouraging them to rethink, reimagine, and redesign how this finite space in cities can serve more people and more functions.

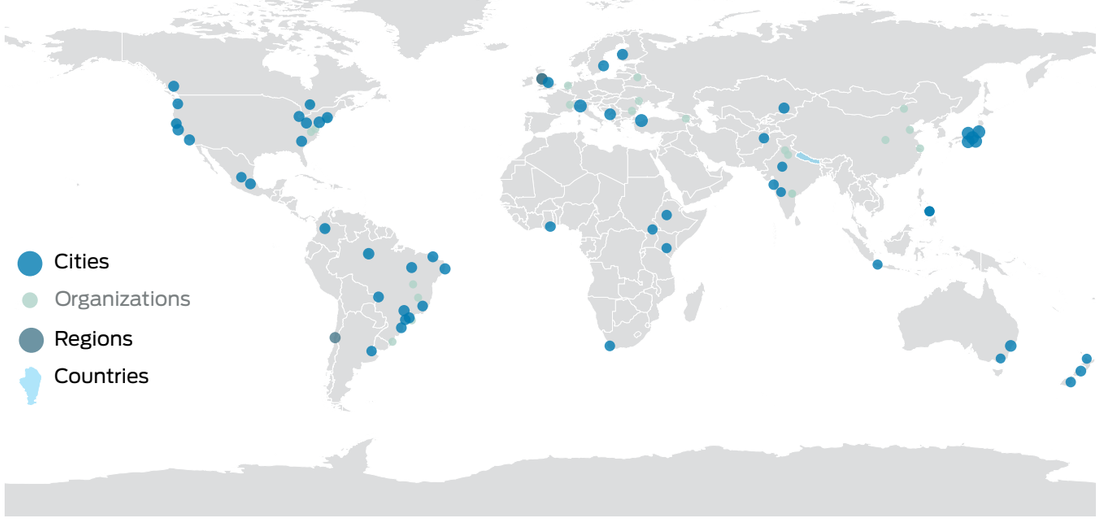




Available in five languages

The Global Street Design Guide is now available in English, Chinese, Portuguese, Spanish, and Italian. Coming soon in Japanese and Russian.

Endorsed by 100+ cities, countries, and organizations



About iRAP

The International Road Assessment Programme (iRAP) is a registered charity dedicated to saving lives by eliminating high-risk roads throughout the world.

Who we are

iRAP is a charity that works in partnership with governments, road authorities, mobility clubs, development banks, NGOs, and research organizations around the world. We provide the tools and training to assess and measure the safety of roads, create the business case for investment in safer roads, and track performance against road safety targets.

iRAP was formed in 2006 and has facilitated the development of road assessment work in more than 100 low, middle and high-income countries. iRAP is the umbrella organisation for regional RAPs in Europe, Asia and the Pacific, the Americas, and Africa.

What we do

iRAP provides the intelligence, tools, technology and training to:

- **Inspect high-risk roads and develop Star Ratings, risk maps, and safer roads investment plans**
- **Build, support and sustain national, regional and local capability**
- **Track road safety performance so that funding agencies can assess the benefits of their investments**
- **Advocate for safer road policies, planning, design, and investment**

About iRAP Star Ratings

iRAP Star Ratings provide a simple and objective measure of the level of safety provided by a road's design. Star Ratings use a robust, evidence-based approach to assess the risk for four road user groups: pedestrians, bicyclists, motorcyclists, and vehicle occupants. iRAP's Star Ratings are the global standard for road infrastructure safety and are embedded into the UN Road Safety Targets.

Target 3: By 2030, all new roads achieve technical standards for all road users that take into account road safety, or meet a three star rating or better.

Target 4: By 2030, more than 75% of travel on existing roads is on roads that meet technical standards for all road users that take into account road safety.

Star Ratings represent the infrastructure-related risk of death or serious injury. A five-star street is the safest while a one-star street is the least safe.

Star Ratings of the Global Street Design Guide's renderings will assist road engineers, designers, and politicians to better understand the link between high quality road design and safety.

The renderings included in the Global Street Design Guide are representative of the most common street types around the world, and offer a broad selection of conditions for readers to compare to their own city streets. The Star Ratings fortify the design guidance by grading the safety improvements that are made between the before-and-after scenarios.

Where an intersection is included in the rendering, a Star Rating is provided for the street without an intersection present and with an intersection present. This is done to convey the additional risk of an intersection on road user safety and the ways in which it influences Star Ratings.

Star Ratings are provided for each road user group: pedestrians, bicyclists, motorcyclists, and vehicle occupants. However, Star Ratings are not produced for road user groups that do not have official use of the road. For example, there would be no vehicle occupant Star Rating on a pedestrian-only street. In this case, the Star Rating appears as N/A with grey stars. For Star Ratings on the 1-5 scale, the following color breakdown is used:

Star Rating	Infrastructure-related risk of death or serious injury
5	Extremely low risk
4	Low risk
3	Moderate risk
2	High risk
1	Extremely high risk
-	N/A

It is important to note that Star Ratings are very sensitive to traffic speeds. Even if a design encompasses all of the physical features shown, a change in the speed will significantly affect the safety outcome of that design. The speeds used to model the Star Ratings are clearly labelled on each of the examples.

The Star Ratings of the selected renderings consistently show a significant improvement in safety between the "before" and "after" scenarios, which demonstrates the effectiveness of the guidance in the Global Street Design Guide for improving road safety. *To find out more about iRAP Star Ratings, visit www.irap.org.*

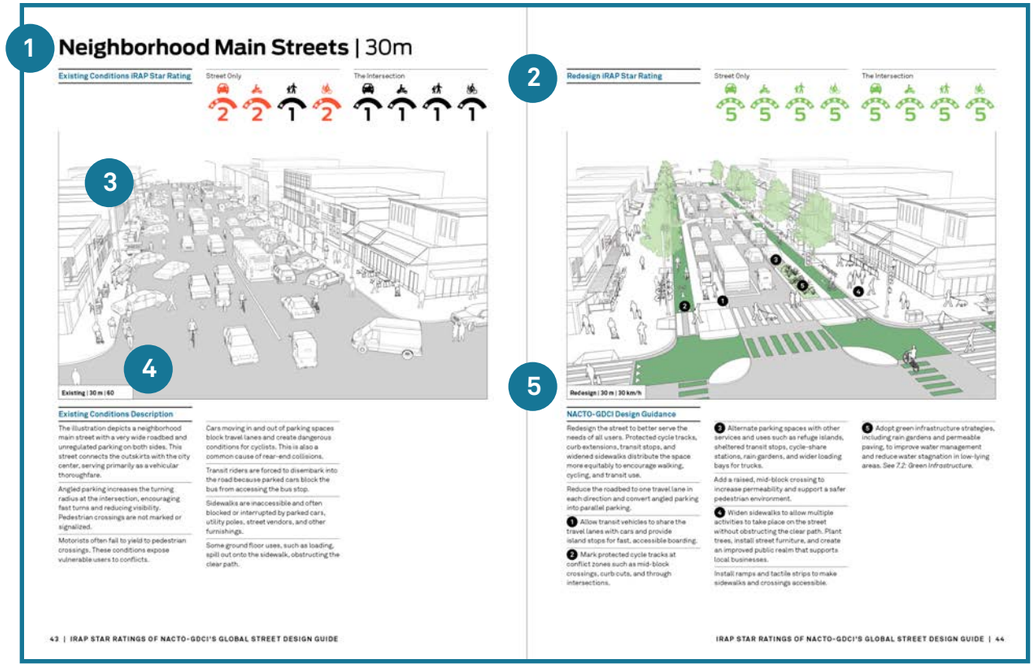
About this Document

The Global Street Design Guide, developed by NACTO's Global Designing Cities Initiative and supported by Bloomberg Philanthropies, marked a step toward changing the old road hierarchy, with designs that save lives, prioritize people and sustainable mobility, reflect diverse communities, and better serve everyone on the street. Released in 2016, this guide allows readers to review, choose, and adapt the tools and strategies that best apply to a particular context. This global blueprint for safer and higher-performing streets has been endorsed and applied by cities and organizations around the world to address the 1.35 million road crash deaths and up to 50 million injuries occurring annually.

Since road safety is the primary lens of the Global Street Design Guide, iRAP's Star Rating methodology offers a useful framework for validating the design strategies highlighted in the publication. The Star Ratings of the GSDG's transformations provide decision-makers, engineers, and designers around the world with possible reconfigurations for a variety of street and intersection types, drawing from global case studies that have also been endorsed by iRAP's proven methodologies. For those using the iRAP methodology, this effort can also offer ideas and potential strategies for achieving higher safety ratings while simultaneously supporting broader citywide goals.

The GSDG transformations aim to create a 5-star environment for all road users while supporting mobility outcomes that can best provide for healthy, safe, sustainable, equitable, and liveable cities for both current and future generations.

How to read the spreads



Existing conditions

Redesigned conditions

1. Street typology and right-of-way
2. iRAP Star Ratings
3. Renderings showing existing and redesigned conditions from the Global Street Design Guide
4. Operating speeds
5. NACTO-GDCI design guidance, from the Global Street Design Guide

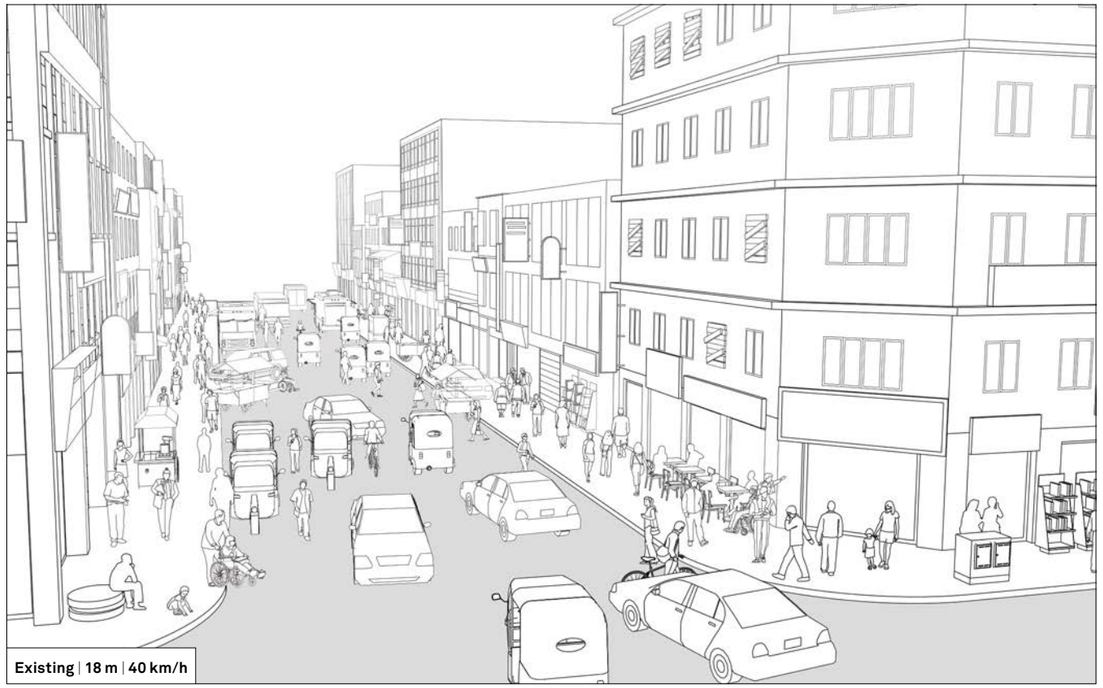
Star Rated Global Street Design Guide Renderings

Pedestrian-Only Streets | 18 m

Existing Conditions iRAP Star Rating

Street Only: 4 4 4 4

The Intersection: 3 3 3 4



Existing | 18 m | 40 km/h

Existing Conditions Description

Traffic congestion and commercial activities might block the sidewalks and overtake the pedestrian environment.

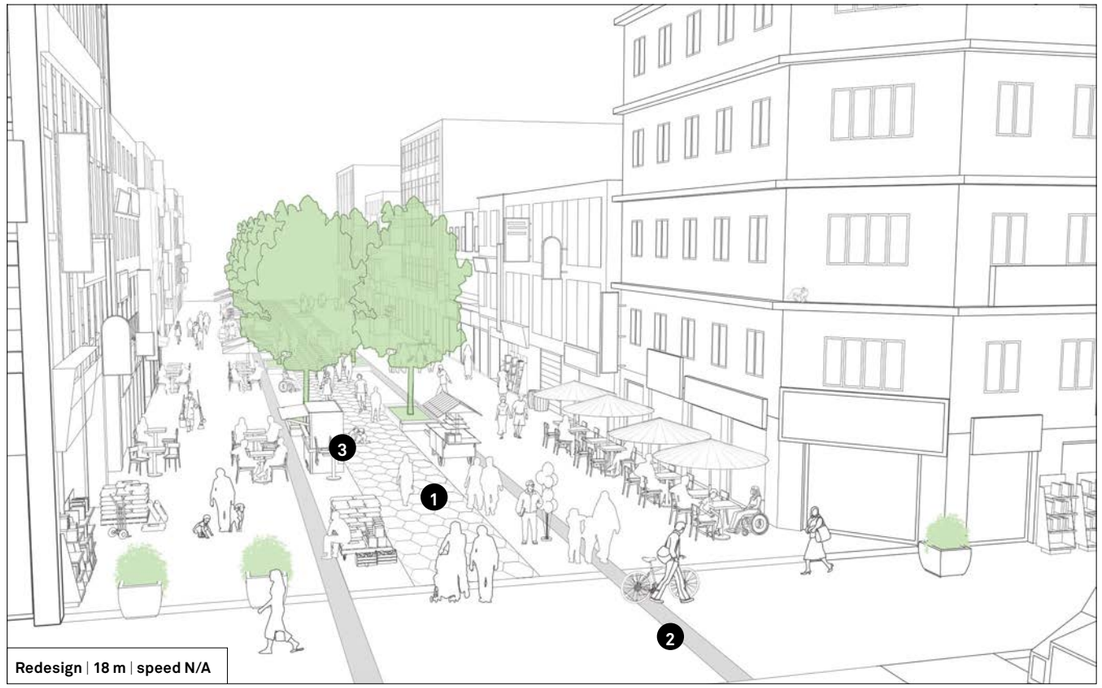
Destinations on both sides of the street result in frequent mid-block crossing and multiple desire lines.

Pedestrian-only streets might function as a shopping street, with dense commercial and mixed-use activity, serving high pedestrians volumes.

Redesign iRAP Star Rating

Street Only: N/A N/A 5 5

The Intersection: N/A N/A 5 5



Redesign | 18 m | speed N/A

NACTO-GDCI Design Guidance

Explore pedestrianization when pedestrians overflow onto the roadbed on a regular basis.

Carefully select streets to be pedestrianized based on immediate context. Lack of pedestrians can render these streets unsafe and uninviting. Pedestrian-only streets should be situated in high-density, mixed-use office or commercial areas where pedestrian numbers are high.

Pedestrian-only streets must be well connected to collective transit, cycle routes, and walking paths. Access from side streets or through streets should offer multiple options to move in and out of the corridor, keeping the space permeable. *See 6.3.2: Pedestrian Networks.*

Provide drop-off and pick-up points for vehicles carrying passengers with ambulatory difficulties.

1 Minimum clear paths should be maintained to allow emergency vehicle access. Prohibit parking and vehicular traffic to ensure that clear paths remain unobstructed.

Provide a smooth and level surface to optimize walking accessibility. While clear paths are not required to be straight and direct, they must be continuous and navigable.

2 Use durable and slip-resistant materials. Provide accessibility ramps and tactile paving to assist the visually impaired.

3 Add street furniture, artwork, seating, tables, benches, trees, landscaping, cycle racks, and water fountains to add character and support a range of activities.

Restrict loading access to certain times of day, preferably off-peak hours, for local businesses and residences.

Lighting must support a safe environment. Facade lighting, pedestrian-scale light poles, and shorter light fixtures can be used to evenly light the space. *See 7.3.1: Lighting Design Guidance.*

Schedule regular maintenance to keep the space clean. Waste receptacles should be provided, and their number based on pedestrian volumes.

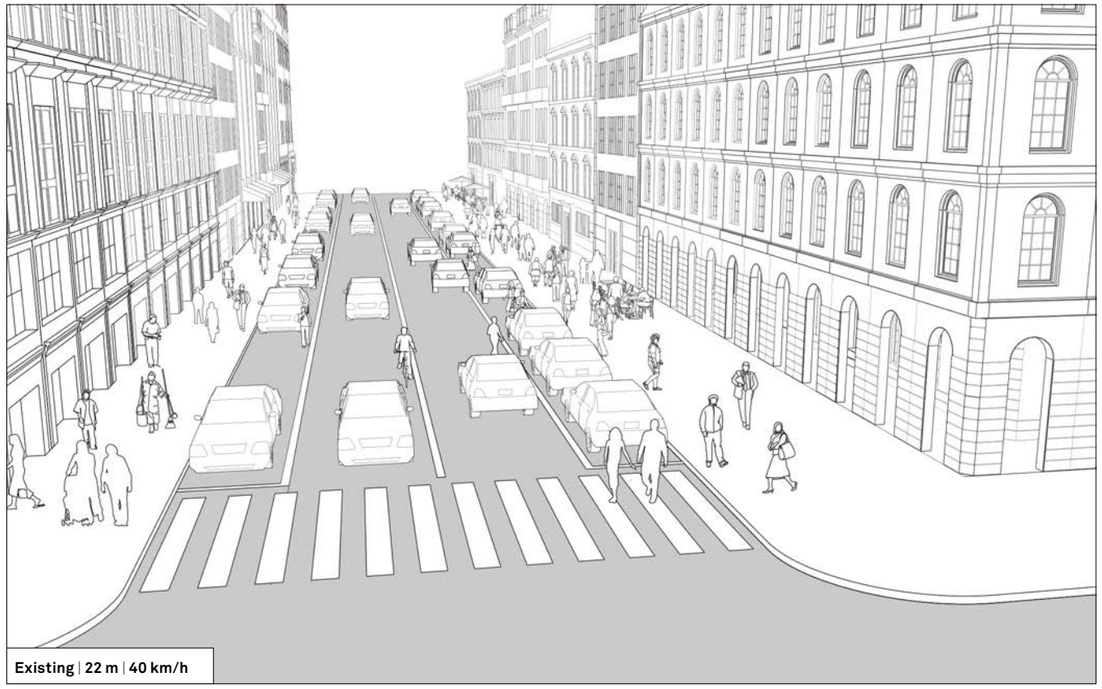
Program activities and events, particularly if the corridor is long. Create frontage zones and vendor spaces to organize on-street activity. Ensure breaks are provided between vendor areas to maintain visibility and permeability.

Pedestrian-Only Streets | 22 m

Existing Conditions iRAP Star Rating

Street Only: 5 4 4 5

The Intersection: 3 3 4 4

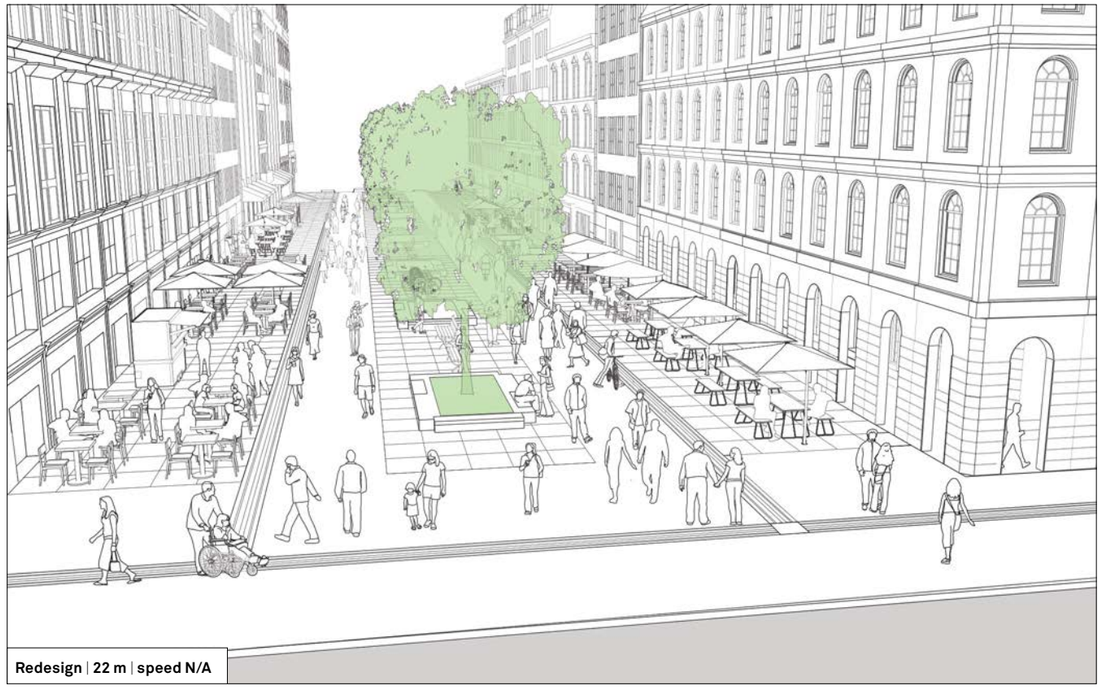


Existing | 22 m | 40 km/h

Redesign iRAP Star Rating

Street Only: N/A N/A 5 5

The Intersection: N/A N/A 5 5



Redesign | 22 m | speed N/A

Additional Considerations

In some cases, a complete pedestrianization may be appropriate only for a few blocks where pedestrian traffic is the highest.

The types of businesses and land uses that occupy the pedestrian corridor and its side streets will affect the street's function and character at different times of day.

Temporary pedestrianization, using bollards, posts, and diverters, can provide an opportunity to collect comparative data and determine the impacts of closing the street to traffic permanently.[2]

Shared streets or other pedestrian-priority streets can be implemented in streets with lower pedestrian volumes to complement pedestrian-only streets or transit. *See 10.2: Shared Streets.*

Provide signs that encourage cyclists to disembark and walk with their cycles, especially in high pedestrian-volume corridors.

Depending on pedestrian density and street width, it may be appropriate to allow cycles in the street if they travel close to walking speeds.

Laneways and Alleys | 8m

Existing Conditions iRAP Star Rating

Existing Conditions Description

Laneways are generally lined by continuous buildings on both sides, creating a strong sense of enclosure.

Commercial laneways are typically activated by small-scale retail, workshops, galleries, cafés, or restaurants. Rents for these spaces are initially low, inviting new businesses to move in and attracting customers to the space.

They are often in close proximity to larger central streets or public spaces, and offer convenient access to key destinations.

They provide beneficial shortcuts for pedestrians traversing large city blocks, increasing the overall permeability of the city.

Residential laneways may be faced by garages and limited residential access. Alleys and laneways may be important for local utilities and waste collection, but may be poorly lit and trafficked, creating an unsafe atmosphere for pedestrians.

Redesign iRAP Star Rating

Design Guidance

1 Increase the frontage area available for businesses in the city and create intimate environments by transforming laneways and alleys with active ground floor uses.

Each lane must be assessed and designed on a case-by-case basis to ensure that loading and other services can be accommodated when needed.

If vehicles are given access, limit travel speed to 10 km/h.

2 Maintain an accessible clear path of 3.5 m for emergency vehicle access. Permanent furniture may be placed along building edges, or located at the center of the lane, while maintaining a clear path along the buildings. Movable furniture can be placed in the emergency access path so long as they do not impede necessary but infrequent movements. Plan for local emergency access and provide adjacent through routes. *See 6.7: Designing for Freight and Service Operators.*

Provide cycle parking and cycle-share facilities in the immediate surroundings of the laneway.

Prohibit parking in laneways except under special circumstances.

Restrict access for loading and deliveries to early morning and late evening when pedestrian activity is lower.

Use lighting to shape the character and experience of the space while providing a safe environment at all hours.

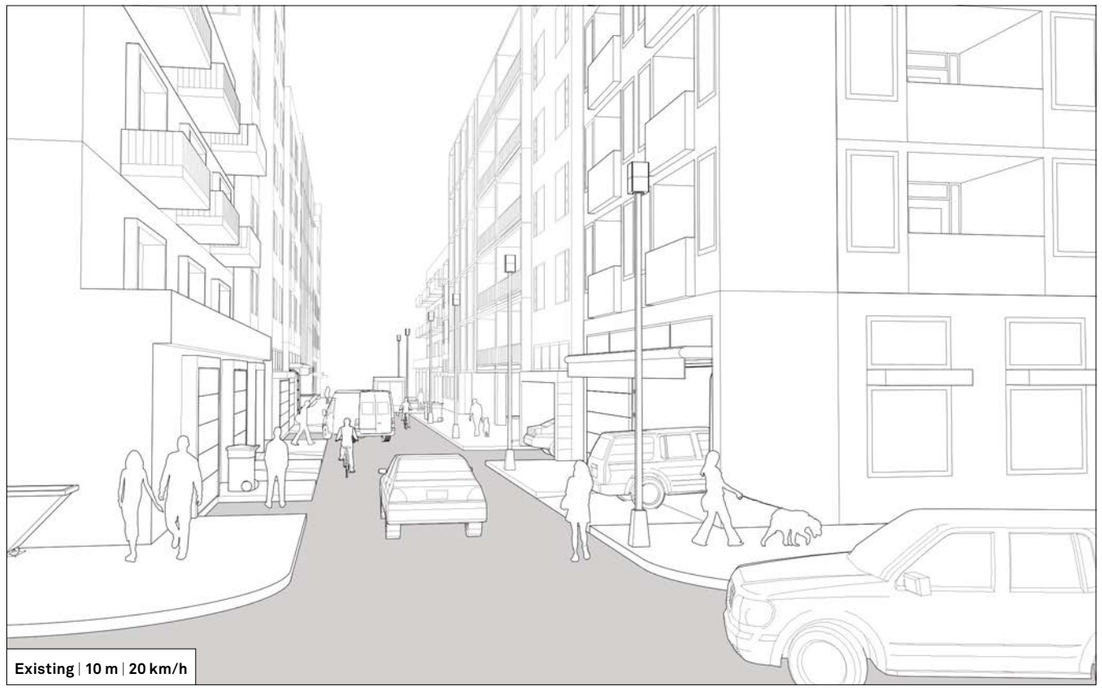
Schedule regular maintenance and management to ensure that the laneway remains clean and free of obstacles.

Design pavement slope to assure efficient drainage of primary pedestrian areas.[4]

Where a laneway meets a higher-traffic street, provide raised pedestrian crossings to suit the context, street size, and travel speeds.[5] *See 6.3.5: Pedestrian Crossings.*

Laneways and Alleys | 10 m

Existing Conditions iRAP Star Rating



Existing | 10 m | 20 km/h

Redesign iRAP Star Rating

Redesign | 10 m | 10 km/h

Additional Considerations

Local climates will affect the street experience and use. Consider covering laneways to provide protection from the weather and encourage year-round use. Screens may be used to protect from wind.

Engage local artists, residents, and businesses to shape the character of the space according to uses and business types.[6]

Use of signage, building textures, and material variety on building edges add visual interest to the laneway.

Commercial laneways should have active ground-floor activities. Encourage businesses to provide large and transparent openings directly onto the lane to increase activity.

Parklets

Existing Conditions iRAP Star Rating

Existing Conditions Description

Parklets generally entail the conversion of two or more parallel parking spaces, or three to four angled parking spaces. The configuration will vary according to the site, context, and desired character of the installation.

Parklets may be installed on streets that have high pedestrian volume and local business activity, but lack public space for pedestrians.

Where on-street parking is often obstructed due to spillover of street activity, the city can allow the change in use of one or more parking spaces through a permitting process, requiring that the spaces remain open and accessible to the public.

Redesign iRAP Star Rating

NACTO-GDCI Design Guidance

1 Parklets must be buffered using a wheel stop at a desired distance of **1.2 m** from the parklet to ensure visibility to moving traffic, pedestrians, and parked vehicles. This buffer may also serve as a space for adjacent property owners to accommodate curbside trash collection.

2 Incorporate vertical elements such as flexible posts or bollards to make parklets visible to traffic.

Allow a minimum width of **1.8 m** for the parklet, or the width of the parking lane.

Provide small channels between the base and the platform to facilitate alternate drainage, so that the design of a parklet does not inhibit stormwater runoff.

3 Ensure that parklets have a flush transition at the sidewalk and curb to permit easy access and avoid trip hazards.

Place parklets at least **5 m** away from the intersection. Where the installation of a parklet is under consideration for a site near an intersection, analyze volumes of turning traffic, pedestrian flows, sight lines, and visibility.

Furnish parklets in ways that make theft impossible or unlikely. Site selection should consider the level of surveillance both during the day and at night.

Use movable tables and chairs and integrate seating and other features into the parklet structure to enhance flexibility and usability. Work with partners to manage moveable furniture and potentially store them elsewhere overnight.

Designs for the substructure of a parklet vary and depend on the slope of the street and overall design of the structure. The substructure must accommodate the crown of the road and provide a level surface for the parklet.[7]

Deck-pedestals spaced under the surface at different heights are commonly applied to achieve flush level surface. Another method is to provide steel substructure and angled beams.

Use slip-resistant surfaces to minimize hazards and ensure wheelchair accessibility.

Load-bearing capacity of floors varies by local agency. At a minimum, design for **450 kg/m**.[8]

Include an open guardrail to define the space. Railings should be no higher than **0.9 m** and capable of withstanding at least **90 kg** of horizontal force.

Pedestrian Plazas

Existing Conditions iRAP Star Rating

Existing Conditions Description

Large or complex intersections often have confusing traffic patterns, especially for pedestrians, which results in chaotic and uninviting walking.

Irregular crosswalks create long pedestrian crossing distances, which increase exposure time for vulnerable users and encourage informal crossings along desire lines.

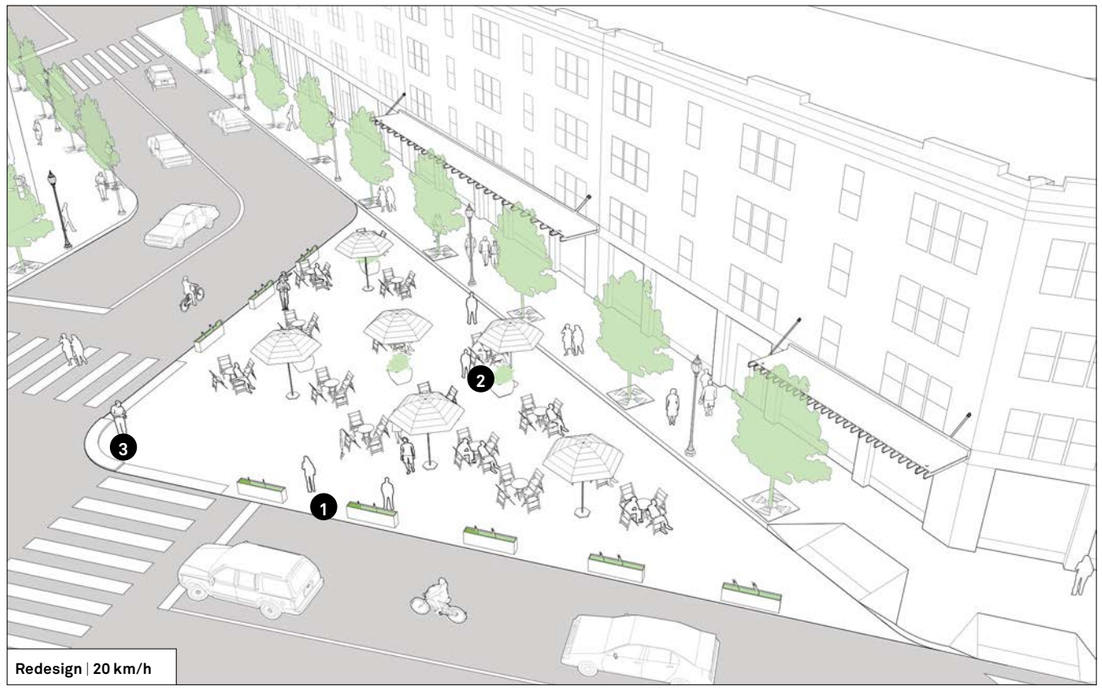
Complex geometry creates large tracts of underutilized pavement, further degrading conditions of safety and comfort.

NACTO-GDCI Design Guidance

Rethinking the dimensions of the street to better balance the needs of all users reveals excess spaces. These spaces can be re-attributed to pedestrian use, contributing to a neighborhood's open space needs.

Use public plazas to reconfigure and revitalize intersections that might otherwise be unsafe or underutilized. Plaza reconfigurations make intersections safer by slowing traffic speeds, simplifying complex traffic patterns, and helping to mitigate potentially dangerous conflicts. *See 11.11: Complex Intersection: Adding Public Plazas.*

Redesign iRAP Star Rating



Plazas transform and activate underutilized street segments and provide relief where pedestrian demand is unmet and foot traffic overflows into the roadway. They make the roadway and intersections more compact, and easier for pedestrians to cross.

Prohibit parking within the public plaza. Initial enforcement may be required to prevent unauthorized parking.

1 Define the edges of the plaza with official markings that prohibit vehicles from entering the space. This can be done by painting or by adding bollards or planters.

Give proper attention to navigation by individuals with low vision or mobility impairments; provide accessible ramps and surfaces, and tactile warning strips with high color contrast between modal zones. *See 6.3.8: Universal Accessibility.*

Take local climate and durability into consideration in the selection of materials and the maintenance plan of the plaza.[11]

Provide adequate lighting to ensure safety at all hours.

2 Provide a mix of permanent and temporary seating to permit flexible use of the space and limit costs. Maintenance partners should determine whether furniture should be secured at night.[12]

3 Corners and other areas of a plaza that are subject to encroachment or turning vehicles should be reinforced using heavy objects such as planters and bollards that alert drivers to the new curb line.

Install cycle parking or cycle-share stations where space permits.

Accommodate early morning or late night freight loading and unloading in temporary and permanent designs.

Integrate drainage channels and permeable surfaces into the design of the plaza. Sites should have minimal cross slope and use edge treatments that mitigate the overall slope.

Commercial Shared Streets | 12m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

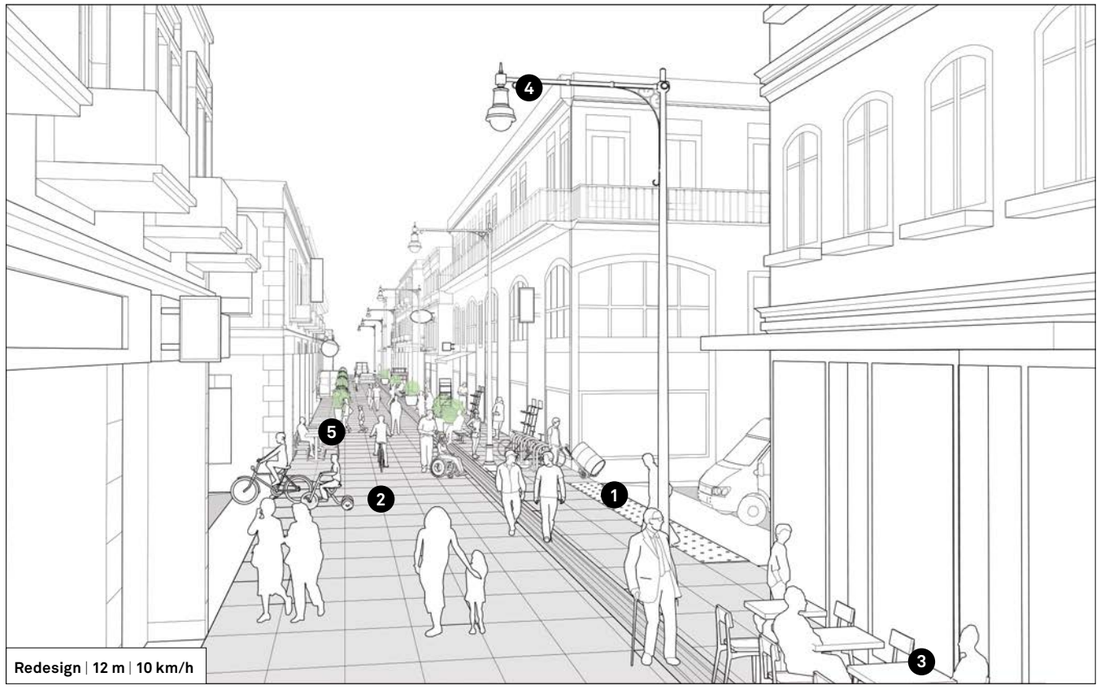
Existing Conditions Description

Shared streets are often the default condition in historic cities with narrow rights-of-way. One or two narrow travel lanes may be shared between cars, motorcycles, cycles, and loading vehicles. Due to the limited space, these streets may have narrow and inaccessible sidewalks, with utility boxes and light poles obstructing the pedestrian space. In some contexts, sidewalks are occupied by street vendors and informal parking, forcing pedestrians onto the roadbed.

Redesign iRAP Star Rating

Street Only

The Intersection



NACTO-GDCI Design Guidance

Design strategies must prioritize vulnerable users, ensuring that clear paths are maintained. Work with local accessibility groups to ensure design, materials, and facilities meet local guidelines or standards.

Consider local climate and material availability when developing design. Drainage channels and permeable materials should be provided in accordance with existing curb lines and slope.

Textures and paving must align with the curb to reinforce the pedestrian-priority of the street.

1 Provide tactile warning strips at the entrance to all shared spaces. Warning strips should span the entire intersection crossing. *See 6.3.8: Universal Accessibility.*

2 Maintain a clear path for delivery vehicles, and mark dedicated areas for vehicular movement with a change in paving pattern or type.

3 Use street furniture, including benches, planters, artwork, trees, water fountains, bollards, and cycle parking, to provide definition within the shared space and to delineate the travel lane from pedestrian-only areas.

Depending on the overall street width, consider providing a **1.8 m** wide, continuous clear path that is protected from traffic to ensure universal accessibility.

Install signage to educate the public on how to use a shared street in the early stages of conversion.

4 Light the streets evenly to create a safe and inviting environment. Light poles and fixtures for shared streets can be designed to add character and a sense of the local context. *See 7.3.1: Lighting Design Guidance.*

5 Include landscaping, such as planters and trees, where possible. Incorporate permeable pavers and rain gardens as a part of the larger green infrastructure and water-management strategies.

Use movable planters to restrict vehicular traffic access at certain times of the day.

Cities are encouraged to experiment with car-free hours or test shared streets using temporary materials to evaluate the potential impact on traffic operations.

Commercial Shared Streets | 14 m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

The illustration above demonstrates the same principles as outlined on the previous page in a different context with a wider street width.

Redesign iRAP Star Rating

Street Only

The Intersection

Residential Shared Streets | 9 m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

Existing | 9 m | 40 km/h

Existing Conditions Description

Buildings may have little or no setbacks, and drainage channels may run on both sides of the street, below or next to the sidewalks. In some contexts, these channels are uncovered.

Limited space can result in narrow and discontinuous sidewalks that are inaccessible and blocked by parking.

Shared streets may emerge as an existing condition informally, especially in suburban or largely unplanned residential settlements.

Pedestrian facilities on residential streets may be poor or entirely missing, with motor vehicles dominating the right-of-way.

The most accessible section of the street is often the center, where pedestrians may be discouraged from walking by pressure from motor vehicles.

Redesign iRAP Star Rating

Street Only

The Intersection

Redesign | 9 m | 10 km/h

NACTO-GDCI Design Guidance

Transform streets with low vehicular volumes and high pedestrian activity into shared streets.

Treat this street as a slow street. Use vertical and horizontal deflections to slow driving speeds. *See 6.6.7: Traffic Calming Strategies.*

Use curbs and surface treatments that create unusual geometries to enhance the feeling of shared environments and encourage drivers to reduce speeds by diverting their path of travel.

Design shared residential streets to operate intuitively as shared spaces, where pedestrians are prioritized. Use signage to educate the public in the early stages of implementation. Residential shared street signage often depicts children playing to make motorists aware of entering a low-speed area.

1 Test designs with interim strategies and low-cost solutions. Movable planters, sculptures, street furniture, and designated parking may act as horizontal speed deflectors and help achieve the desired results.

2 Design clear gateways onto the shared street, with narrow vehicle path entries to slow vehicular traffic to appropriate speeds. Use grade changes, paving textures and colors, and tactile strips to alert pedestrians when they are crossing out of the shared street into general traffic space.

Designate zones for parking, landscaping, and flexible activities to create a chicane condition and slow vehicular traffic. Flexible zones allow streets to be used by residents as an extension of their homes, as play zones by children, and as cycle parking.

Maintain a clear path for cars and cycles. The path can be defined using landscape, street furniture, parking zones, street utility poles, or textured pavers.

Use textures and street furniture to reinforce priority for pedestrians.

3 Change materials and colors to demarcate different zones. Parking zones must be clearly marked to avoid unregulated parking.

Provide drainage channels at the center of the street or along the flush curb, depending on underground utilities and other existing conditions.

Select pavings, material, and furniture based on regional climate and durability. Opt for snow-compatible materials for colder climates or permeable pavers for places with high rainfall. *See 2.9: Implementation and Materials.*

Residential Shared Streets | 10 m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

The illustration above demonstrates the same principles as outlined on the previous page but in a different context and with a wider street width.

Redesign iRAP Star Rating

Street Only

The Intersection

Residential Streets | 13 m

Existing Conditions iRAP Star Rating

	Street Only				The Intersection			
	5	5	5	5	4	4	5	5

Existing | 13 m | 20 km/h

Existing Conditions Description

This illustration shows a two-way residential street with parking on both sides.

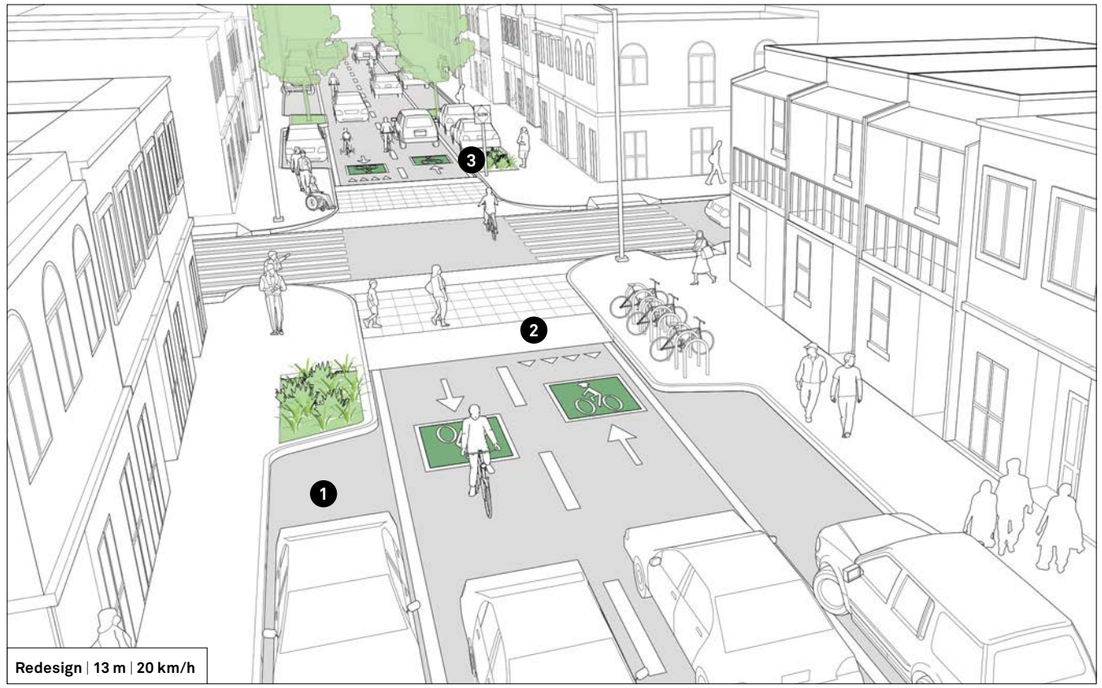
Residential streets might be designed with minimal sidewalks, limited vehicular access, and low volumes, allowing them to operate informally as slow zones.

Varied conditions on either side of the street are characterized by absent or cluttered sidewalks, and parallel or perpendicular parking.

To maintain low speeds and volumes on these streets, poorly designed speed bumps might occasionally be installed.

Redesign iRAP Star Rating

	Street Only				The Intersection			
	5	5	5	5	5	5	5	5



Redesign | 13 m | 20 km/h

NACTO-GDCI Design Guidance

Maintain one travel lane in each direction with a maximum of **3 m** lane width. *See 6.6.4: Travel Lanes.*

Design sidewalks to provide accessibility ramps and continuous unobstructed clear paths.

This configuration has tight dimensions due to restricted space. When more space is available, or the amount of parking can be reduced, allocate additional pedestrian space for a better walking environment with landscaping and street furniture.

1 Alternate curb extensions and rain gardens with parking spaces to create pinchpoints on the streets, which help in speed reduction.

Utilize these curb extensions to locate street trees, light poles, cycle racks, and other street furniture.

Cyclists can ride safely in mixed traffic when streets are designed for 20 km/h. *See 9.1: Design Speed.*

2 Introduce raised crosswalks at the intersections, which act as speed calming measures and prioritize pedestrians. *See 11.5: Small Raised Intersection.*

3 Support traffic calming strategies with clearly marked speed limits.

Residential Streets | 16 m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

Existing Conditions Description

This one-way residential street has unregulated curbside parking and wide travel lanes that encourage speeding and render the street unsafe for vulnerable users.

Sidewalks are discontinuous or non-existent, resulting in a lack of accessibility for pedestrians. Driveway ramps, stoops, light poles, and other utilities create frequent obstructions.

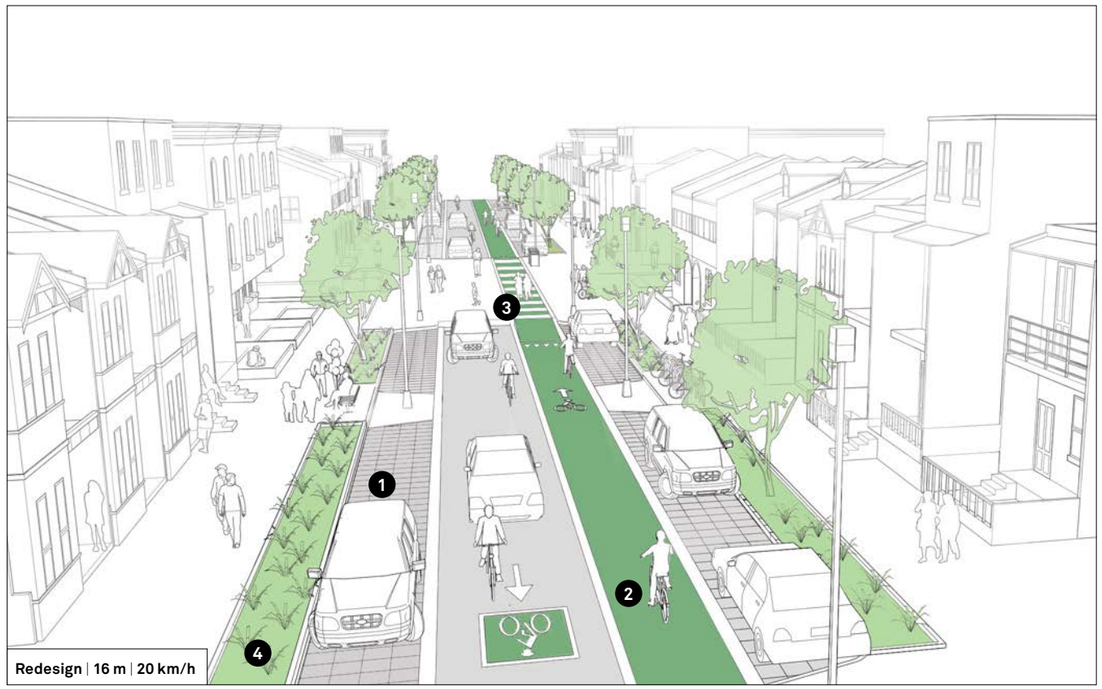
Drainage channels run on both sides of the street, either under or next to the sidewalks. In some places, these channels might be uncovered.

Lack of shade and uneven lighting make the street unappealing during hot weather and at night.

Redesign iRAP Star Rating

Street Only

The Intersection



NACTO-GDCI Design Guidance

Transform the street by removing one travel lane, improving sidewalks, and adding a contraflow cycle lane.

1 Avoid perpendicular parking. Provide parallel parking with narrower width to use space efficiently. Alternate parking spaces with dedicated areas for utilities, street furniture, and landscaping to help maintain a clear pedestrian path on the sidewalk.

Since the buildings on this street have minimal setbacks and stoops that extend into the sidewalk, the reconstruction accommodates widened and accessible sidewalks on both sides.

2 Allow cycles in both directions to facilitate a permeable and connected cycle network. In this example, cycle-priority ground markings are added in the travel lane, and a dedicated cycle track runs in the opposite direction.

3 Traffic calming strategies slow vehicular speeds to **20 km/h**, ensuring a safe environment for pedestrians, cyclists, and motorists. Add speed tables at the intersections to facilitate raised crossings and prioritize pedestrians.

Use different paving materials and color markings to distinguish cycle lanes from the travel lane. Road markings may be added.

4 Incorporate green infrastructure strategies by using permeable pavers, rain gardens, and street trees. *See 7.2: Green Infrastructure.*

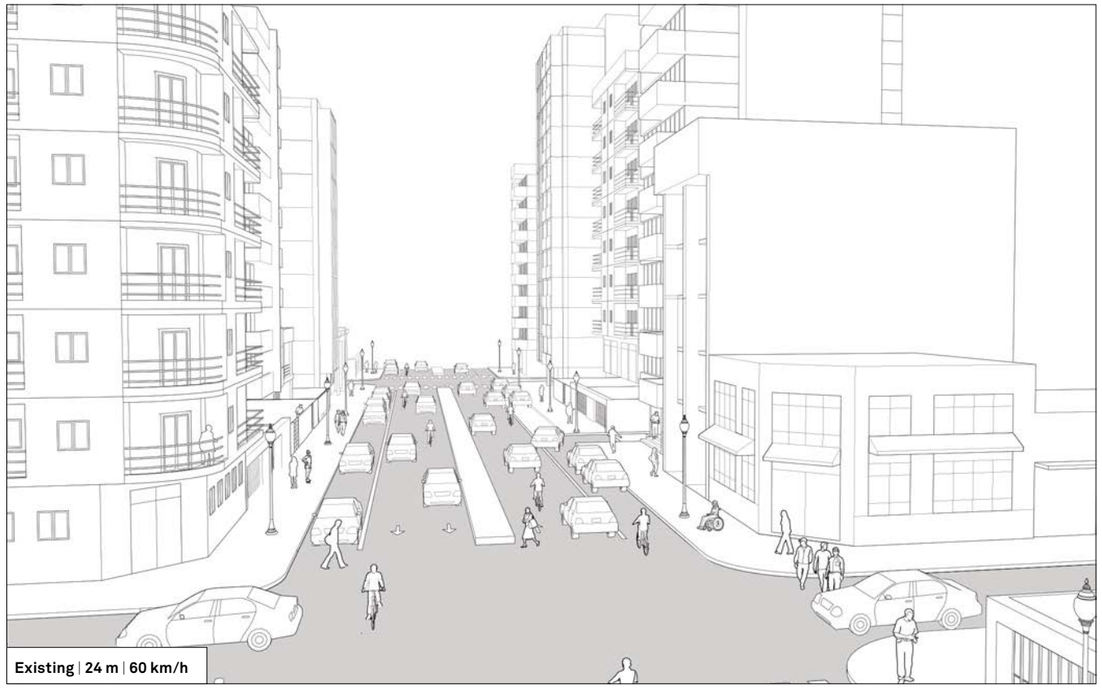
This street transformation is recommended when there is a need to upgrade existing utilities and underground services or lay new ones. *See 2.8: Coordination and Project Management.*

Residential Streets | 24m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 24 m | 60 km/h

Existing Conditions Description

This illustration depicts a two-way street in a high-density neighborhood. The street serves local traffic and some through traffic.

Two wide travel lanes in each direction encourage speeds that are not appropriate for residential streets. Parallel parking is provided on both sides of the street.

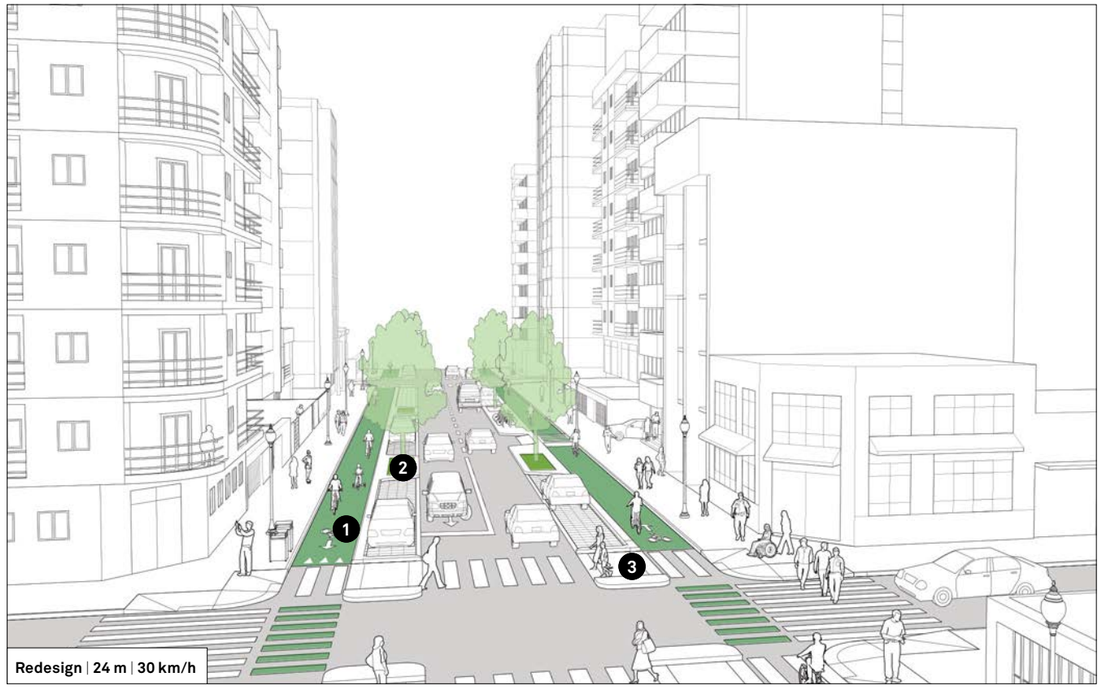
Lack of trees, drainage, or green infrastructure results in unshaded sidewalks and water pooling during heavy rains.

Cyclists share the travel lanes with motorized vehicles.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 24 m | 30 km/h

NACTO-GDCI Design Guidance

Remove one travel lane in each direction and reduce lane widths to **3 m**.

1 Add protected cycle tracks by locating them between the curb and the offset parking lane. Provide these dedicated cycle facilities on each side and connect to other facilities to extend the citywide cycling network. *See 6.4.4: Cycle Facilities.*

2 Alternate parking spaces with trees or rain gardens. Use permeable paving for the parking lane and introduce rain gardens to increase permeability, improve stormwater management, and reduce urban heat island effect.

3 Align pedestrian islands with the parking spaces to protect pedestrians waiting to cross the street.

Place all street lighting, cycle racks, and utility boxes along a common curb zone to create a continuously accessible clear path.

Add accessibility ramps and tactile strips, and maintain existing sidewalk widths. *See 6.3.8: Universal Accessibility.*

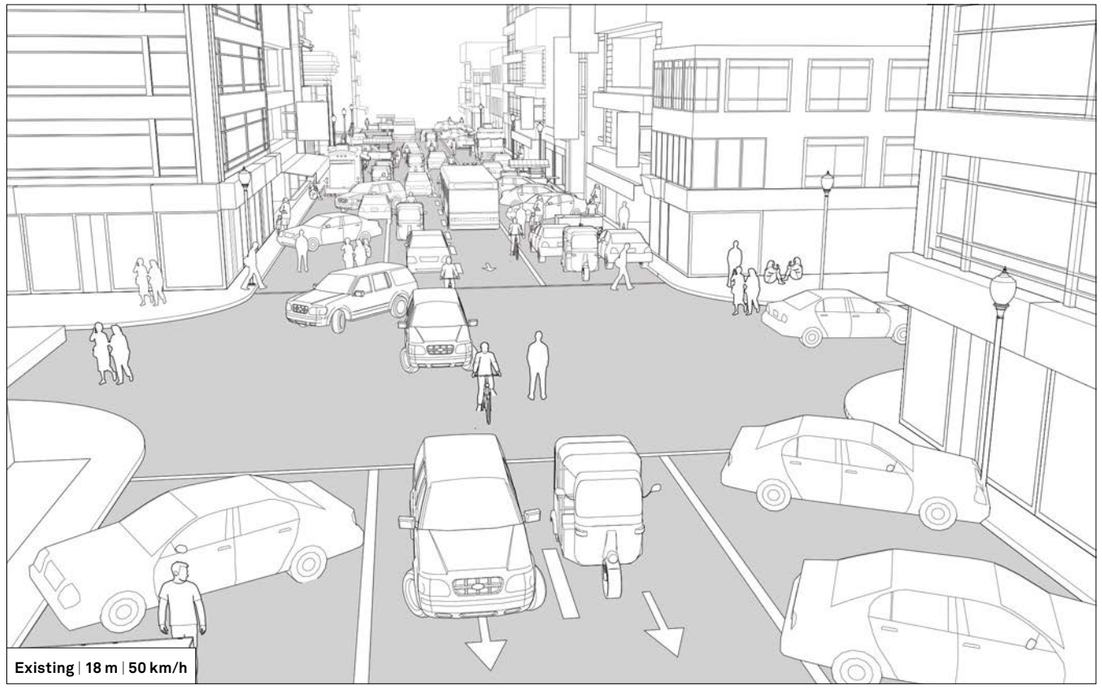
Ensure that all curb cuts and driveways are designed with appropriate ramps for minimal disturbance to the pedestrian clear path.

Neighborhood Main Streets | 18m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing Conditions Description

This example illustrates a main street with two travel lanes in the same direction and unregulated parking on both sides.

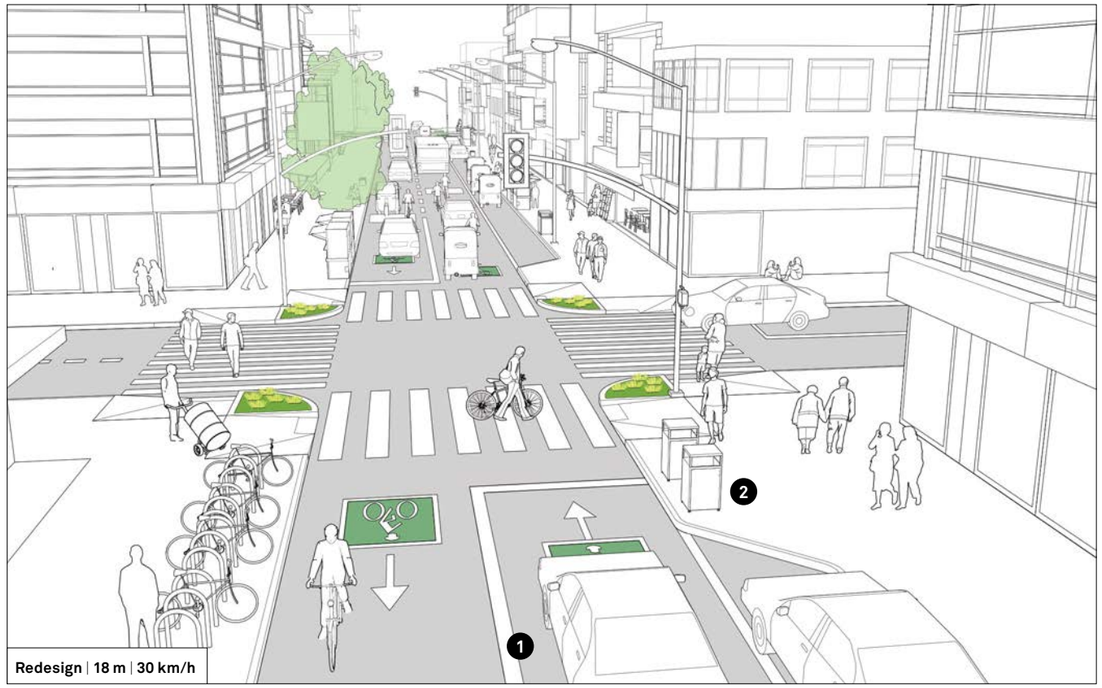
Instead of serving the many functions that a neighborhood street should, the entire right-of-way is dedicated to moving and parked vehicles.

Pedestrians have little choice but to walk on the roadbed and are exposed to unsafe conditions, as they weave through fast-moving traffic and face cars turning at high speeds.

Redesign iRAP Star Rating

Street Only

The Intersection



NACTO-GDCI Design Guidance

Reduce parking and replace it with extended sidewalks and intermittent parallel parking to make the street more inviting.

Lower parking demand can be encouraged by area-wide demand management strategies, including parking pricing.

1 Following larger network analysis, convert this one-way street into a two-way street, to improve transit connectivity and to reduce speeds. Free turns may be restricted to certain corridors to reduce risk of conflicts for pedestrians crossing the street.

2 Add curb extensions to provide additional public space and create pinchpoints at intersections, which slow turning traffic. *See 6.3.7: Sidewalk Extensions.*

Add road markings to indicate shared travel lanes with priority for cyclists.

Plant trees strategically such that they do not impact visibility for pedestrians or obstruct the clear path.

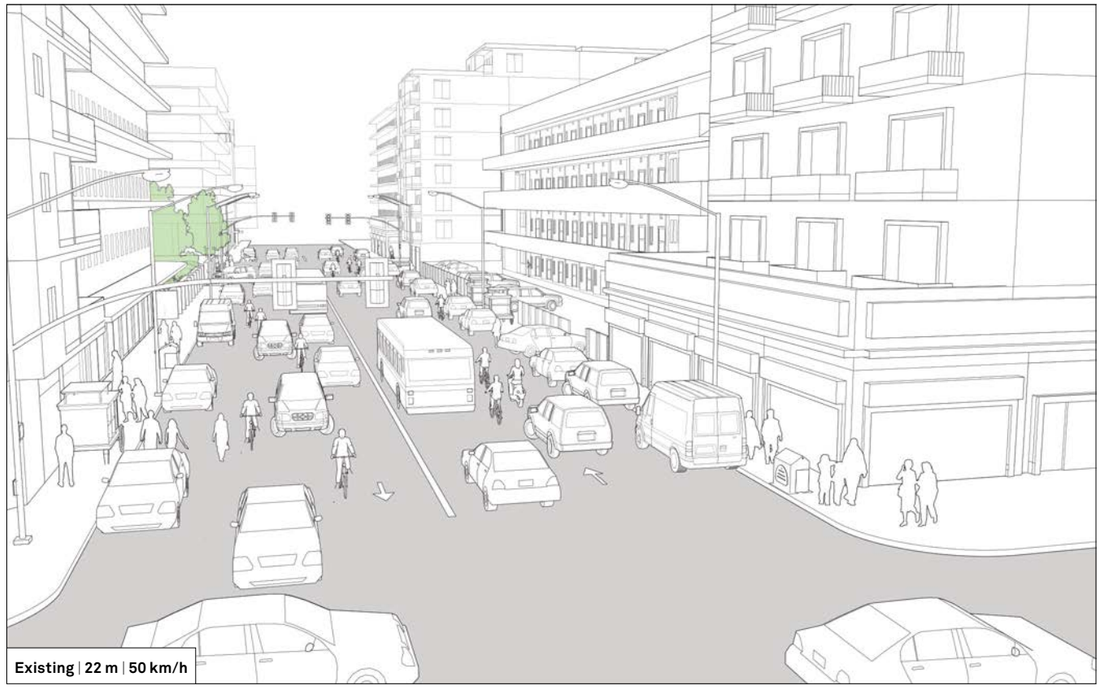
Over time, consider removing private cars to transform this narrow street into a transit mall that prioritizes transit, pedestrians, and cycles.

Neighborhood Main Streets | 22m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 22 m | 50 km/h

Existing Conditions Description

This illustration depicts a neighborhood main street with excessive travel lanes and curbside parking, which fosters a chaotic and auto-centric streetscape. The street is used as a through-way and not as a destination.

Some buildings provide active frontage, while others are set back to accommodate parking.

Such streets might have narrow sidewalks, having been designed primarily for motorists.

Long stretches of fencing along property edges detract from the pedestrian experience and make walking distances seem farther than they are.

Wide travel lanes with narrow medians and a lack of organization and striping invite speeding and double parking.

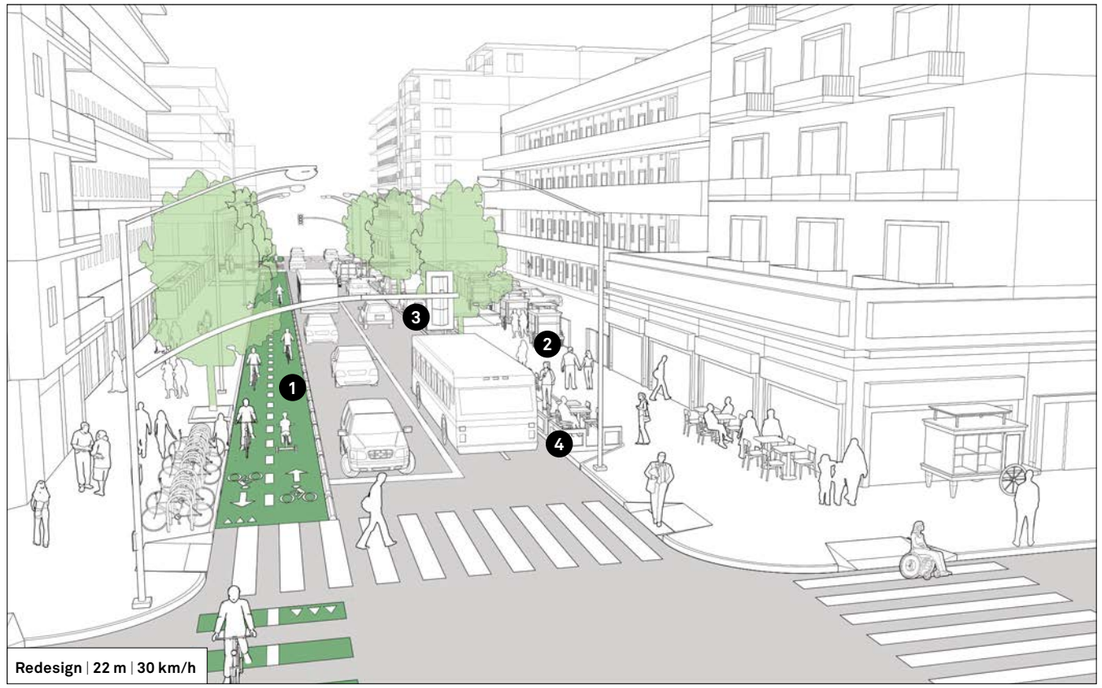
A lack of dedicated cycle facilities puts cyclists at great risk, especially with high traffic volumes.

In some cases, utilities and services may block clear walking paths. The sidewalks and the adjacent roadbed may be encroached on by unregulated car parking, street vendors, and rickshaws, forcing pedestrians onto the roadbed.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 22 m | 30 km/h

NACTO-GDCI Design Guidance

The street is transformed by removing a travel lane in each direction, adding protected cycle lanes, and widening the sidewalks to encourage multiple mobility options.

1 Configure a bidirectional cycle track on one side when the right-of-way width is limited. Vertical elements separating the cycle track are essential to preventing incursions and providing a high level of comfort. *See 6.4.4: Cycle Facilities.*

Widen sidewalks to provide space for vendors, street furniture, artwork, and trees that activate and revitalize the street edge.

2 Locate active uses such as vendors along blank building walls, parking spaces, or fences in order to improve the pedestrian experience. *See 6.8: Designing for People Doing Business.*

3 Provide parallel parking on one side of the street, alternating with trees and green infrastructure. Eliminate parking at intersections and extend curbs to improve safety and increase visibility.

4 Use selected parking spaces for parklets to provide additional public space. *See 10.3.3: Parklets.*

For blocks larger than 100 m, design mid-block crossings between key destinations to increase permeability. *See 6.3.5: Pedestrian Crossings.*

Neighborhood Main Streets | 30m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

Existing | 30 m | 60 km/h

Existing Conditions Description

The illustration depicts a neighborhood main street with a very wide roadbed and unregulated parking on both sides. This street connects the outskirts with the city center, serving primarily as a vehicular thoroughfare.

Angled parking increases the turning radius at the intersection, encouraging fast turns and reducing visibility. Pedestrian crossings are not marked or signalized.

Motorists often fail to yield to pedestrian crossings. These conditions expose vulnerable users to conflicts.

Cars moving in and out of parking spaces block travel lanes and create dangerous conditions for cyclists. This is also a common cause of rear-end collisions.

Transit riders are forced to disembark into the road because parked cars block the bus from accessing the bus stop.

Sidewalks are inaccessible and often blocked or interrupted by parked cars, utility poles, street vendors, and other furnishings.

Some ground floor uses, such as loading, spill out onto the sidewalk, obstructing the clear path.

Redesign iRAP Star Rating

Street Only

The Intersection

Redesign | 30 m | 30 km/h

NACTO-GDCI Design Guidance

Redesign the street to better serve the needs of all users. Protected cycle tracks, curb extensions, transit stops, and widened sidewalks distribute the space more equitably to encourage walking, cycling, and transit use.

Reduce the roadbed to one travel lane in each direction and convert angled parking into parallel parking.

1 Allow transit vehicles to share the travel lanes with cars and provide island stops for fast, accessible boarding.

2 Mark protected cycle tracks at conflict zones such as mid-block crossings, curb cuts, and through intersections.

3 Alternate parking spaces with other services and uses such as refuge islands, sheltered transit stops, cycle-share stations, rain gardens, and wider loading bays for trucks.

Add a raised, mid-block crossing to increase permeability and support a safer pedestrian environment.

4 Widen sidewalks to allow multiple activities to take place on the street without obstructing the clear path. Plant trees, install street furniture, and create an improved public realm that supports local businesses.

Install ramps and tactile strips to make sidewalks and crossings accessible.

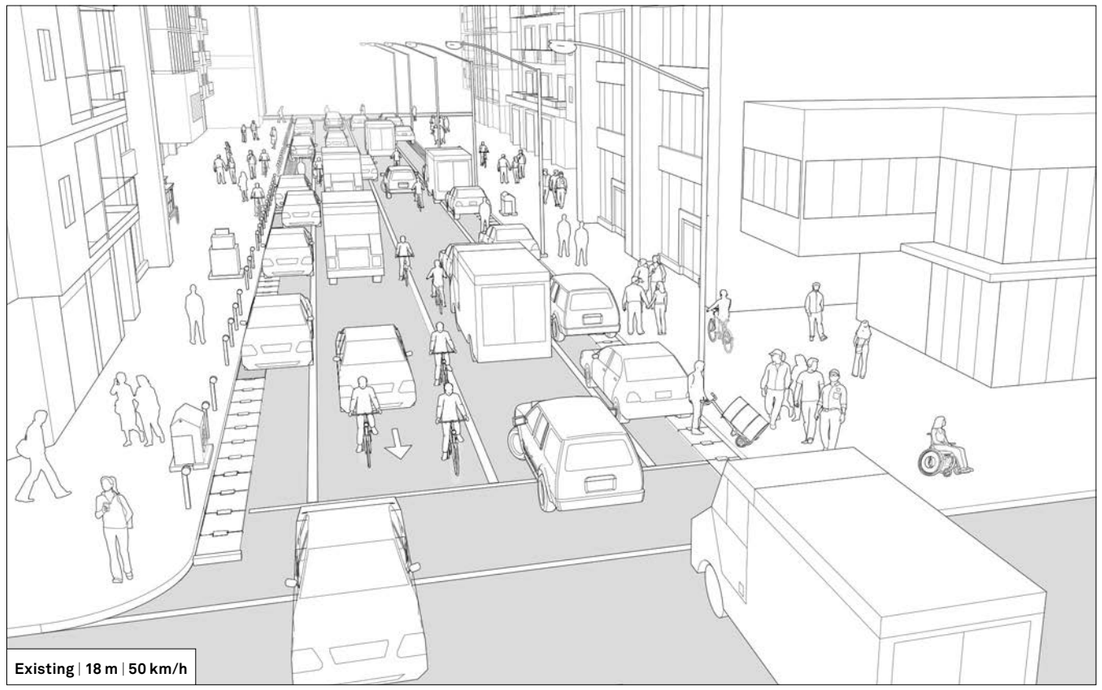
5 Adopt green infrastructure strategies, including rain gardens and permeable paving, to improve water management and reduce water stagnation in low-lying areas. *See 7.2: Green Infrastructure.*

Central One-Way Streets | 18m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

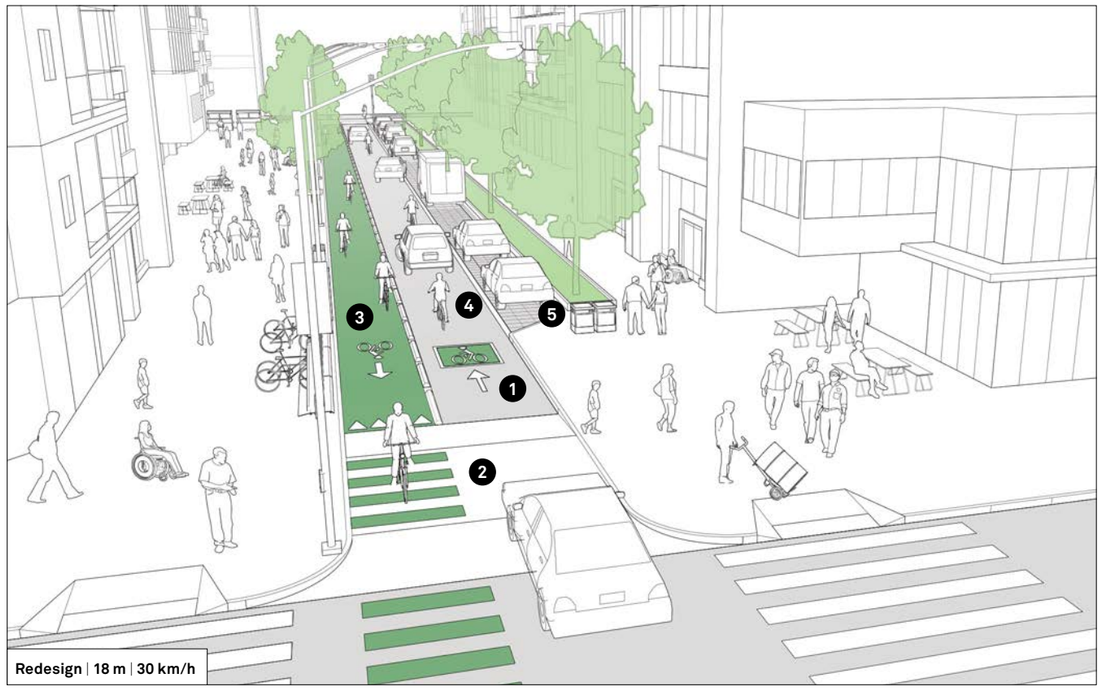


Existing | 18 m | 50 km/h

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 18 m | 30 km/h

Existing Conditions Description

The above illustration depicts a two-way street with one travel lane in each direction, with mixed traffic and parking on both sides.

Frequent destinations on both sides of the street invite parking, stopping and loading that result in weaving traffic and turning conflicts.

A lack of cycle facilities encourages cyclists to ride on sidewalks, creating safety concerns for pedestrians.

Partially concealed drainage channels on both sides of the street present hazards to pedestrians and cyclists.

NACTO-GDCI Design Guidance

1 When constrained two-way operation does not safely accommodate all users, consider conversion to one-way operation, allocating excess road width for pedestrians and cyclists.

2 Reduce travel lane width to **3 m** in order to avoid speeding. Add raised crossings at intersections to prioritize pedestrians and ensure slow traffic speed. *See 6.6.7: Traffic Calming Strategies.*

Widen sidewalks to accommodate commercial activity while maintaining the pedestrian clear path. *See 6.3.4: Sidewalks.*

3 Repurpose the opposing travel lane as an exclusive, raised contraflow cycle track. Contraflow cycle paths are especially important where the cycling network would otherwise require cyclists to significantly detour. *See 6.4.2: Cycle Networks.*

4 Create a shared travel lane with vehicles and cycles in the same direction, with a maximum travel speed of **30 km/h**.

5 Add green infrastructure such as permeable paving under parking spaces, rain gardens, and trees along the sidewalk to help manage stormwater and make the street more appealing.

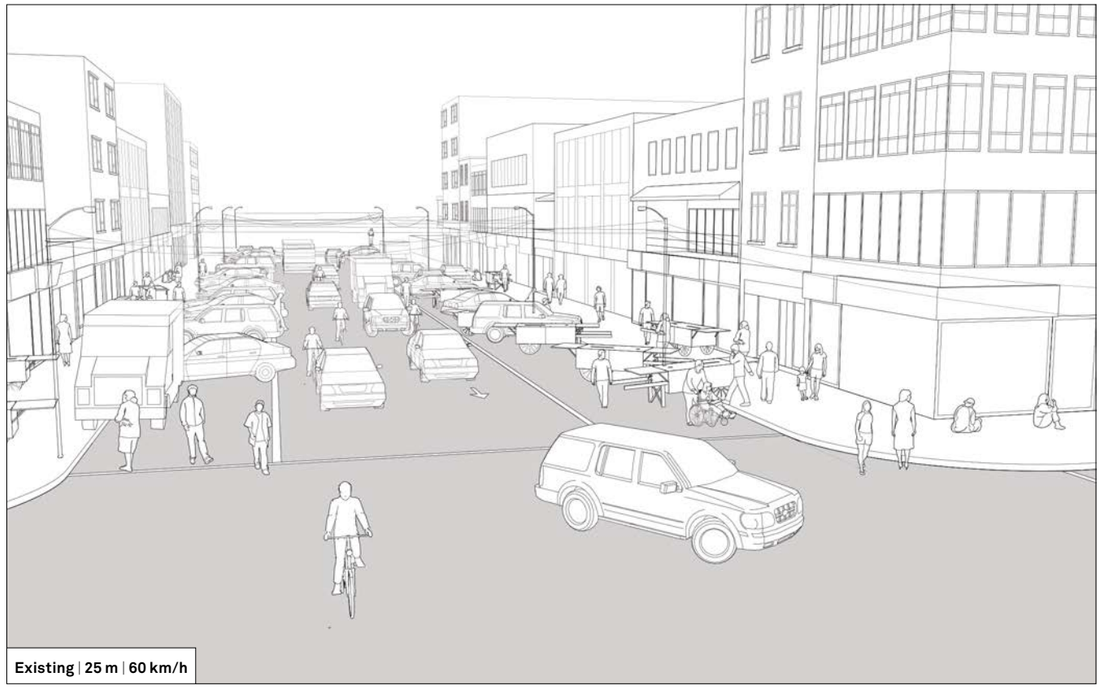
Parklets should be encouraged to provide additional public space.

Central One-Way Streets | 25m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 25 m | 60 km/h

Existing Conditions Description

This illustration depicts a one-way street with intensive commercial activity and local markets, disorganized through-traffic, and unregulated parking.

Insufficient sidewalk space forces commercial activity, vendors, and pedestrians to spill onto the roadbed and into parking lanes.

A lack of crosswalk markings creates an unsafe environment for vulnerable users. High curbs and no pedestrian ramps prohibit universal access.

Unregulated perpendicular parking on both sides of the curb reduces safety and causes delays as cars park into the travel lanes. Small collective transport vehicles often block traffic with passengers boarding and alighting.

This street may have been converted into one-way operation to accommodate increased volume, but it remains congested due to the lack of space allocated for other uses.

Redesign iRAP Star Rating

Street Only

The Intersection

Redesign | 25 m | 30 km/h

NACTO-GDCI Design Guidance

The street is transformed by redistributing the space in a balanced and equitable way.

1 Introduce a dedicated transit lane. Transit can be accommodated in a marked transit lane or in a fully separated curbside transitway. Small structured dividers are located before intersections to prevent vehicle incursions. *See 6.5.4: Transit Facilities.*

2 Ensure that transit stops do not obstruct the sidewalks and are placed in either the parking lane or in the landscaping zone.

Install a parking-protected cycle track to create a safer environment for cyclists. Provide a raised buffer to protect cyclists from dooring.

Provide cycle-share stations to help reduce vehicular traffic and the need for parking. *See 6.4.5: Cycle Share.*

3 Widen sidewalks to provide accessibility and increased space for pedestrians and commercial activity. Alternate parking spaces with additional curb extensions, intermittent landscaping, and dedicated spaces for vendors.

Bury utility lines below grade during reconstruction. *See 7.1: Utilities.*

Consider developing a local permitting process with siting guidelines for vendors. Ensuring that guidelines are enforced and spaces are well-maintained, clean, and free of obstructions will benefit vendors and pedestrians.

Allow wider parking spaces at strategic locations to create loading bays. Restrict freight delivery or encourage off-peak delivery to eliminate double-parking obstructions.

Central One-Way Streets | 31m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

Existing | 31 m | 50 km/h

Existing Conditions Description

This illustration depicts a large one-way street in the center of the city that coexists with a highly active mix of land uses.

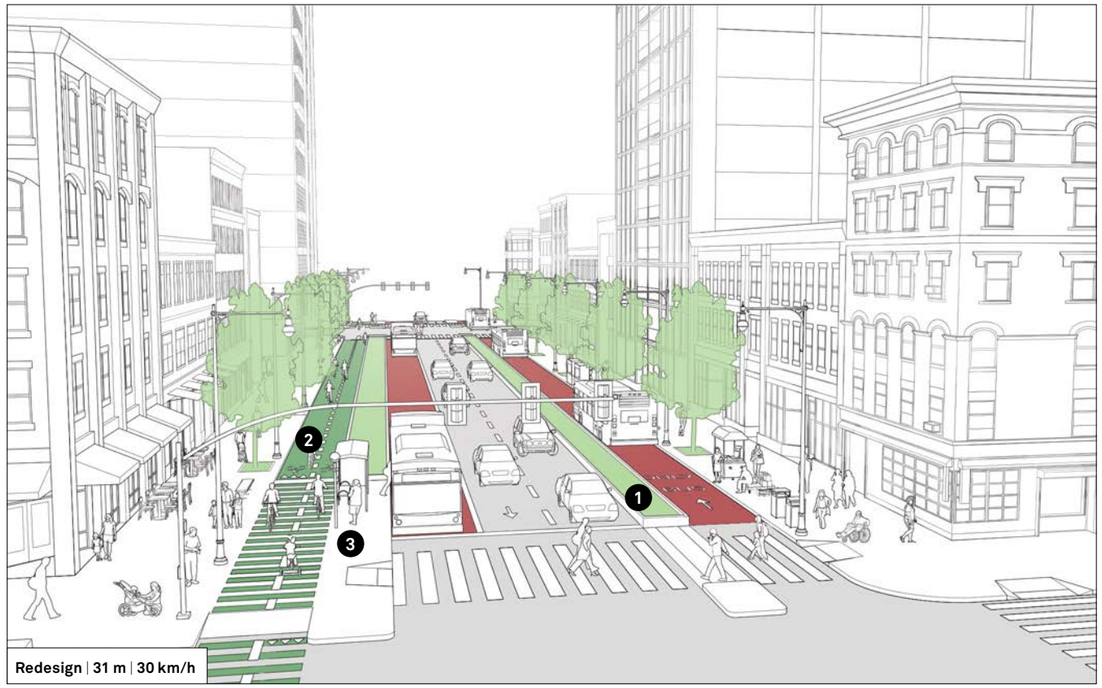
Large one-way streets might be designed for a 60-120 minute peak vehicular traffic period and remain well below capacity at other times of day. Single directional movement of traffic encourages speeding and results in unsafe conditions for all road users.

These streets may support existing transit in mixed traffic.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 31 m | 30 km/h

NACTO-GDCI Design Guidance

1 Convert the one-way, fast-moving street to a two-way street with dedicated transit lanes in both directions. Contraflow transit from adjacent streets can be relocated to operate in a dedicated lane, increasing transit legibility and simplifying routing. Corridor signal progression and turn prohibitions separate conflicting movements.

2 Add a bidirectional, protected cycle track to support cycling as a sustainable mobility option.

Where cycling infrastructure is present, locate transit stops away from the curb, on transit islands, with cyclists routed behind the stop. Locate curbside transit stops within the street furniture zone to avoid obstructions and maintain a clear path for pedestrians. *See 6.4.4: Cycle Facilities.*

Remove car parking at blocks with transit stops to prevent encroachment on bus lanes, reduce transit delays, and limit the need for enforcement.

3 The median also acts as a pedestrian refuge island, reducing the effective crossing distance and creating a friendlier pedestrian environment. *See 6.3.6: Pedestrian Refuges.*

The side median provides additional space for transit stops, cycle share stations, street furniture, and green infrastructure strategies.

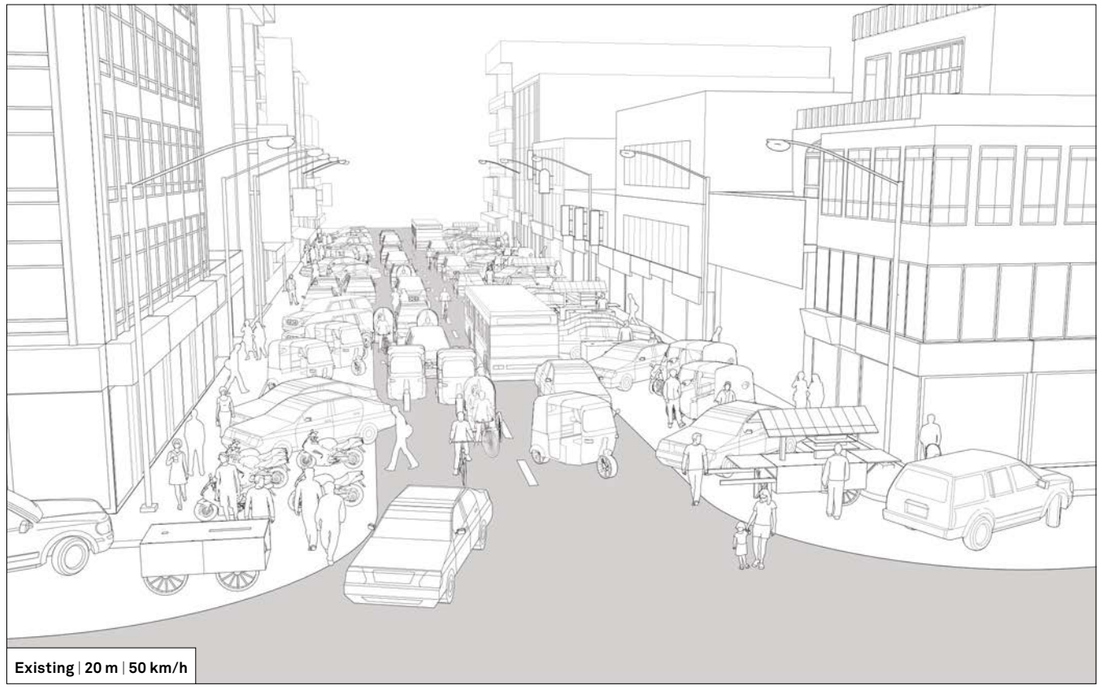
Install signals for cyclists where turns across the cycle track will create conflicts between cyclists and motorists. Align concurrent movements and separate conflicts to create safer intersections. *See 8.8: Signs and Signals.*

Central Two-Way Streets | 20m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 20 m | 50 km/h

Existing Conditions Description

The illustration above depicts a one-way street that was not originally designed for motorized traffic. This street type might have moderate traffic volumes, and its high-pedestrian activity might spill onto the roadbed.

Pedestrians are subject to extreme danger due to motor vehicle speeding, and inaccessible, narrow, and discontinuous sidewalks that are often obstructed by utilities or parked cars.

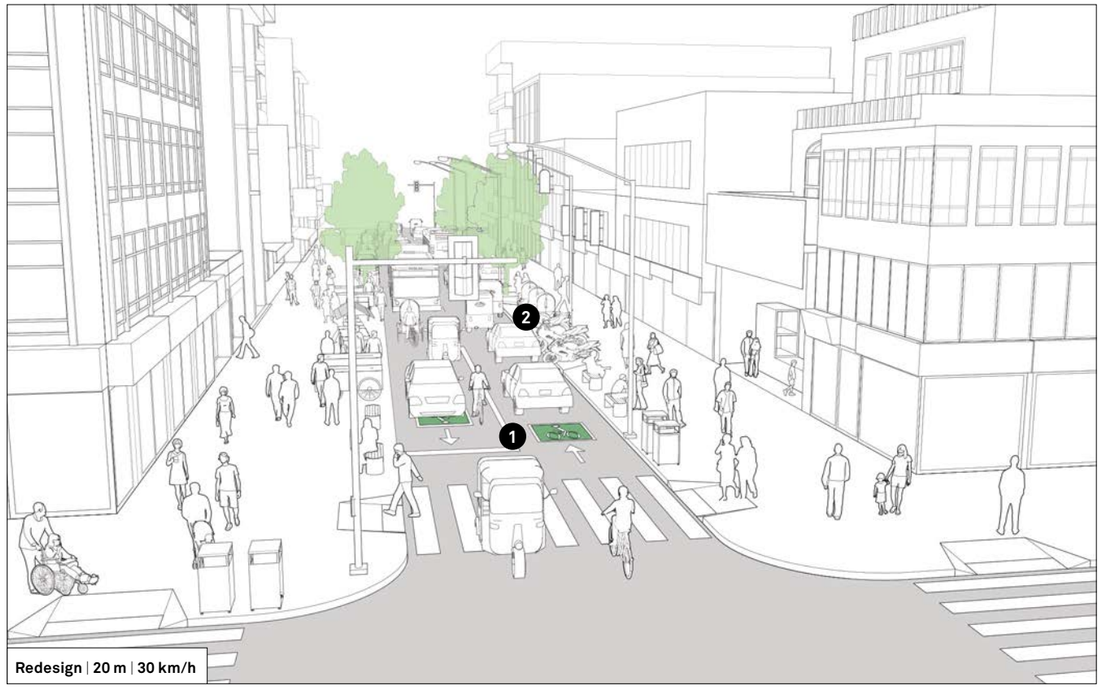
Minimal road markings lead pedestrians to cross the street in undefined and unsafe zones.

Unregulated angled curbside parking and street vendors encroach upon pedestrian space and travel lanes.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 20 m | 30 km/h

NACTO-GDCI Design Guidance

1 Convert the one-way street into a two-way street with one travel lane in each direction. Bidirectional travel reduces vehicular speeding as drivers must be cautious and aware of the oncoming traffic. *See 6.6.4: Travel Lanes.*

Two-way streets increase overall network connectivity but intersections must be carefully designed to minimize conflicts. Mitigate turn conflicts using tight corner radii, leading pedestrian intervals, and turn prohibitions for motor vehicles.

Replace angled parking with regulated curbside parking to provide increased space for sidewalks.

Widen sidewalks to accommodate trees, utilities, and commercial activity while ensuring a clear pedestrian path.

Install curb extensions to shorten pedestrian crossing distances and improve sightlines; lengthening the curb extension creates new public space for curbside amenities and street vendors. *See 6.3.7: Sidewalk Extensions.*

2 Use curbside parking lanes that are flexible zones to accommodate boarding for small collective transit and taxis, dedicated cycle or motorcycle parking, and tree pits.

Create a safer people-centered environment with sidewalk-aligned crosswalks, visible and legible markings, and added public amenities.

Improved pedestrian zones and drop-off areas are beneficial to local business establishments.

Central Two-Way Streets | 30m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

Existing Conditions Description

This illustration depicts a central city street which has been widened over time to accommodate motorized traffic at the expense of pedestrian space.

Wide travel lanes facilitate speeding and hinder pedestrian safety and comfort. Cross-street traffic is not signalized, creating frequent and serious conflicts among motorists and pedestrians.

Narrow and inaccessible sidewalks result in unsafe walking conditions, which can lead to a decline in business activities.

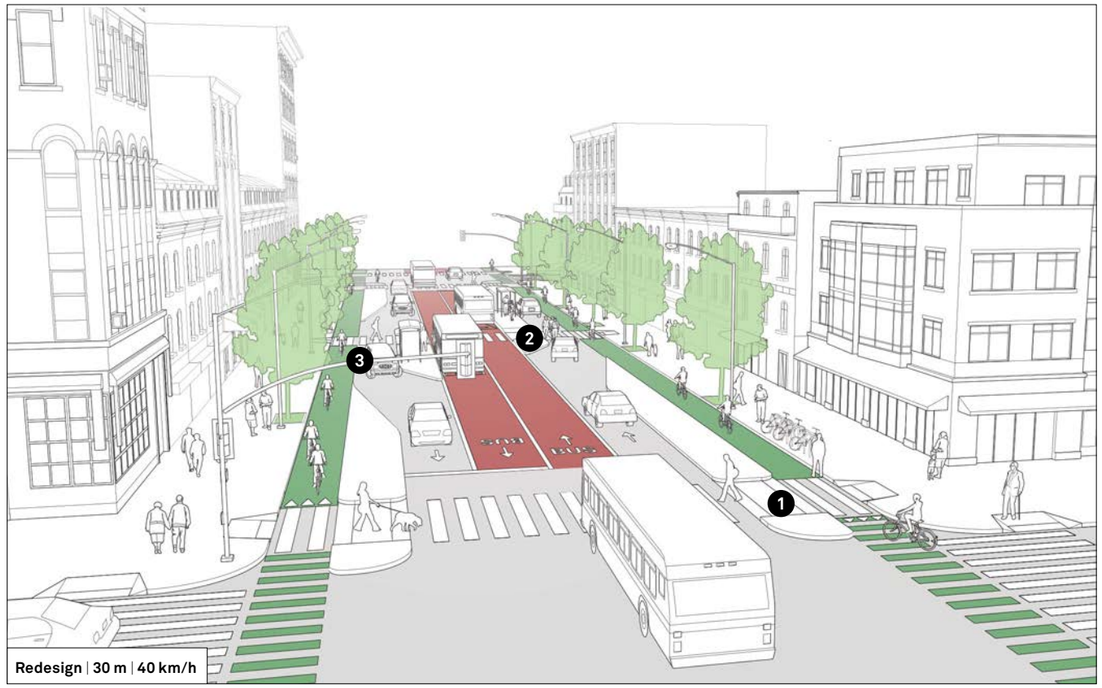
Central medians are equipped with barriers to restrict pedestrian crossing. This configuration often results in unsafe actions by the pedestrians, like jumping over or cutting through the barrier in order to cross the street.

Long crosswalk distances with no clear markings, lack of refuge islands, and high vehicular speeds expose vulnerable users to extremely unsafe conditions. Such streets act as pedestrian barriers and divide neighborhoods.

Redesign iRAP Star Rating

Street Only

The Intersection



NACTO-GDCI Design Guidance

Due to its central location, the street has the potential to transform the surrounding neighborhoods. Redesign this street to serve needs of all street users and increase its overall capacity.

Remove two travel lanes in each direction and provide accessible and wider sidewalks to support safe pedestrian movement and commercial activity.

1 Provide refuge islands, mark pedestrian crossings, and improve markings to make crossings safer and shorter.

Introduce a dedicated transit lane in each direction to increase transit capacity and efficiency.

2 Offset boarding islands provide for safe and efficient boarding and alighting for transit riders while reducing vehicle speeds at the bus stops.

3 Add a mid-block crossing to facilitate the access to the boarding islands on each side of the center-running transit-only corridor and shorten the crossing distance by providing safe refuge islands for pedestrians.

Offset the travel lane in correspondence to the boarding island to reduce speeds and improve motorists' yielding behavior.

Implement cycle tracks on each direction and planted buffers to provide safe facilities for cyclists.

Add trees and green infrastructure on the sidewalks and the medians to provide shade, reduce noise, improve air quality, and support stormwater management. *See 7.2: Green Infrastructure.*

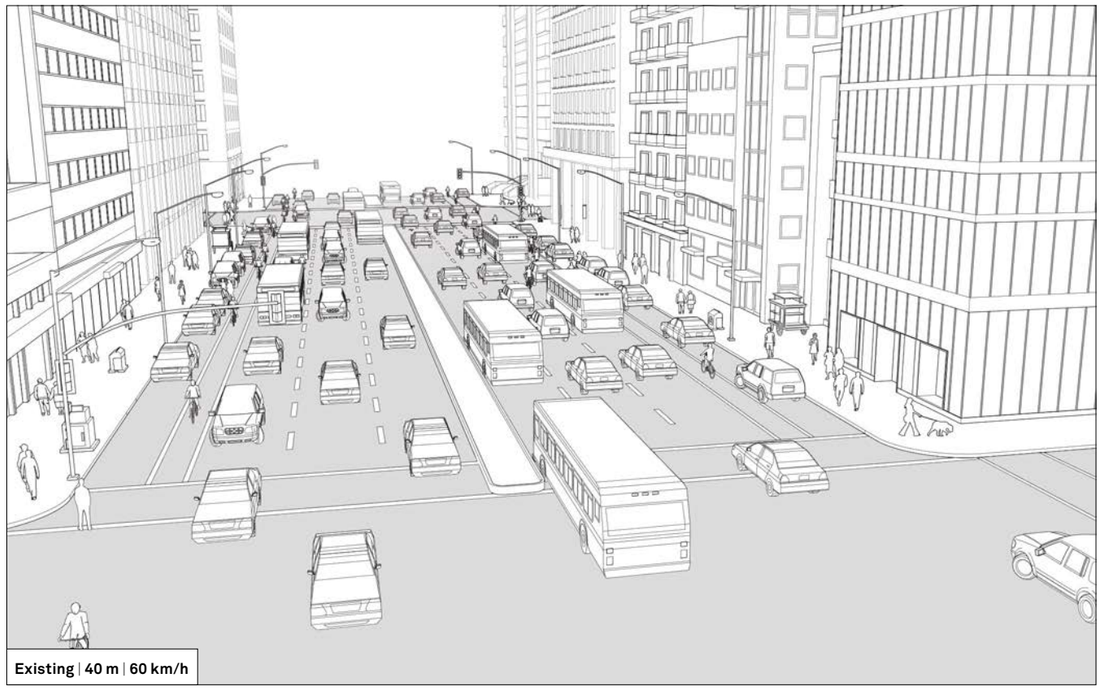
Making the street more aesthetically appealing and comfortable for pedestrian use can attract businesses and help to regenerate the district.

Central Two-Way Streets | 40m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 40 m | 60 km/h

Existing Conditions Description

The illustration above depicts a large two-way street in the center of the city, used both as a thoroughfare and as a destination with a mix of programs. Wide travel lanes encourage speeding and create an unsafe walking and cycling environment.

Cross-traffic turns are a frequent source of conflict, resulting in head-on collisions between motorists and pedestrians or cyclists.

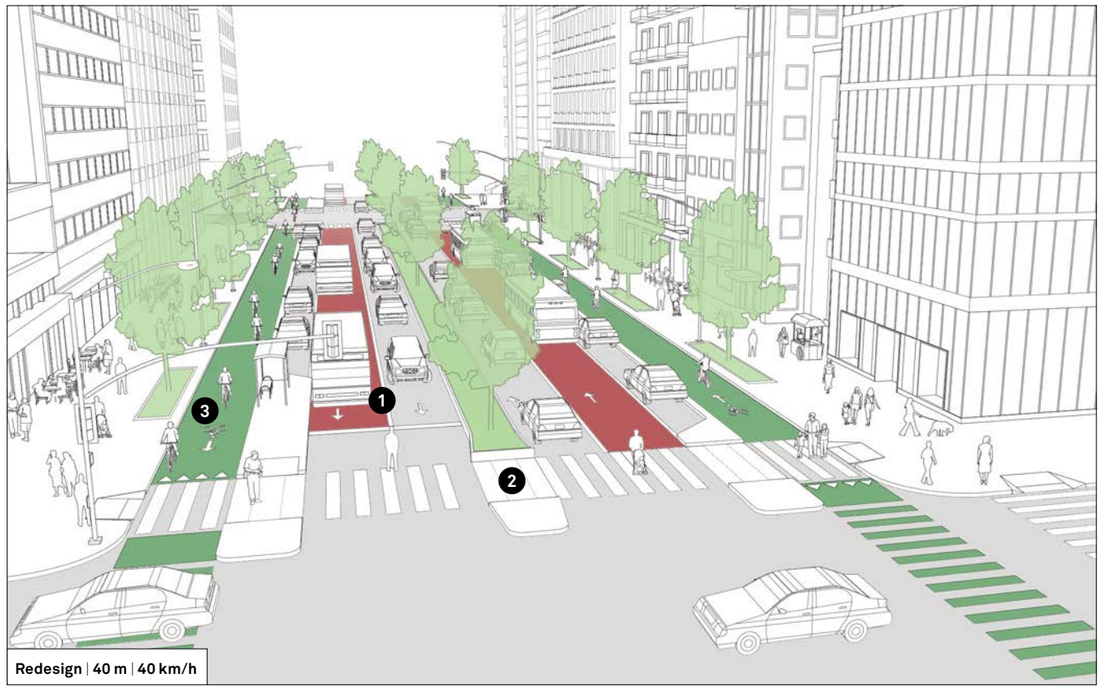
Cyclists feel unsafe riding on narrow cycle lanes located between fast-moving traffic and the curbside parking car door zone. Double-parked vehicles and cars getting into the parking lane may force cyclists to suddenly divert into the adjacent travel lane at great risk.

Wide medians act as an undefined refuge island, creating a pause point in the middle of the street with no protection. Heavy turn volumes and large corner radii at the intersections result in high-speed turns that put pedestrians and cyclists in danger.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 40 m | 40 km/h

NACTO-GDCI Design Guidance

1 Redesign large streets to accommodate both through- and destination-oriented traffic. Give priority to movement of high occupancy vehicles, like mass transit, van-pools, and taxis, to increase the street's capacity.

Add dedicated transit lanes and enable in-lane transit stops using bulbs or islands. *See 6.5.5: Transit Stops.*

If transit frequency is low, consider allowing taxis and other means of collective transport in these lanes to increase the movement capacity.

2 Widen the central median at the intersection and at transit stops to create refuge islands. Refuge islands, when paired with curb extensions at parking spaces, help in reducing time and crossing distances for pedestrians.

Widen sidewalks to provide universal access, add green infrastructure, and increase space for pedestrians and commercial activity.

3 Reduce travel lanes and add parking-protected cycle tracks in each direction.

Side-running directional cycle tracks allow easy and convenient access for cyclists. *See 6.4.4: Cycle Facilities.*

Restrict freight delivery or encourage off-peak delivery to eliminate double-parking obstructions. *See 9.4: Design Hour.*

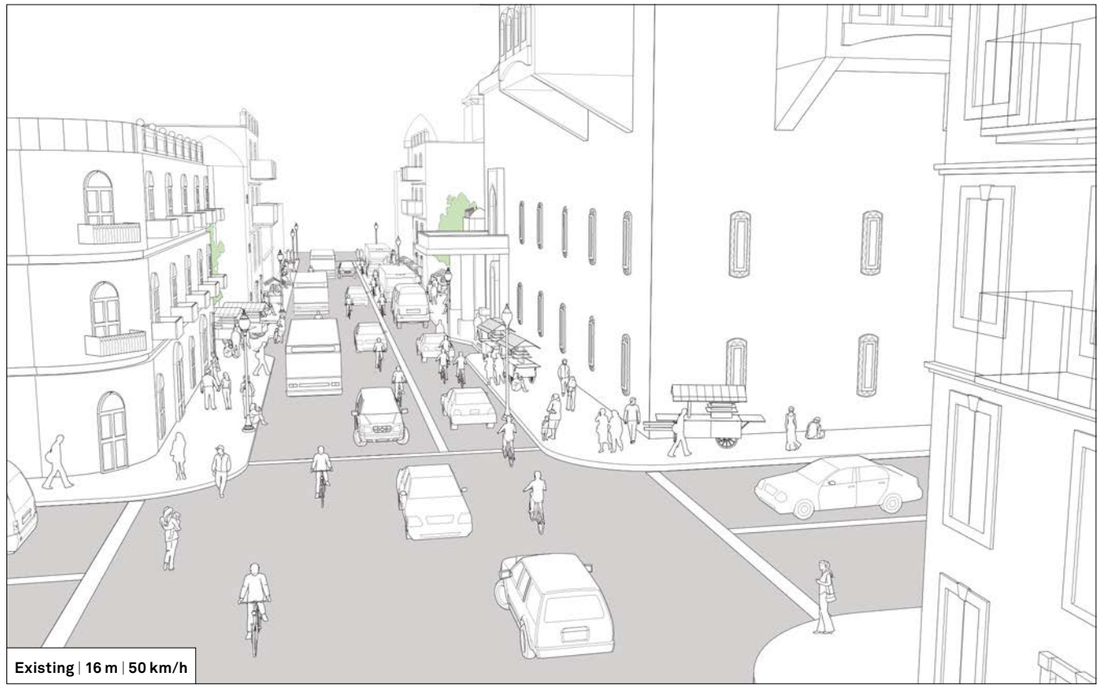
Support new configurations and traffic patterns through education campaigns and proactive enforcement. Allow users time to adjust to significant transformations.

Add landscaping to provide shade and greenery, with potential to supplement stormwater management. These additions may also help attract new businesses.

Transit Streets | 16 m

Existing Conditions iRAP Star Rating

Street Only



Existing | 16 m | 50 km/h

Existing Conditions Description

The condition illustrated above may be found in old parts of cities that were not designed for vehicle use but have evolved over time to accommodate motorized traffic.

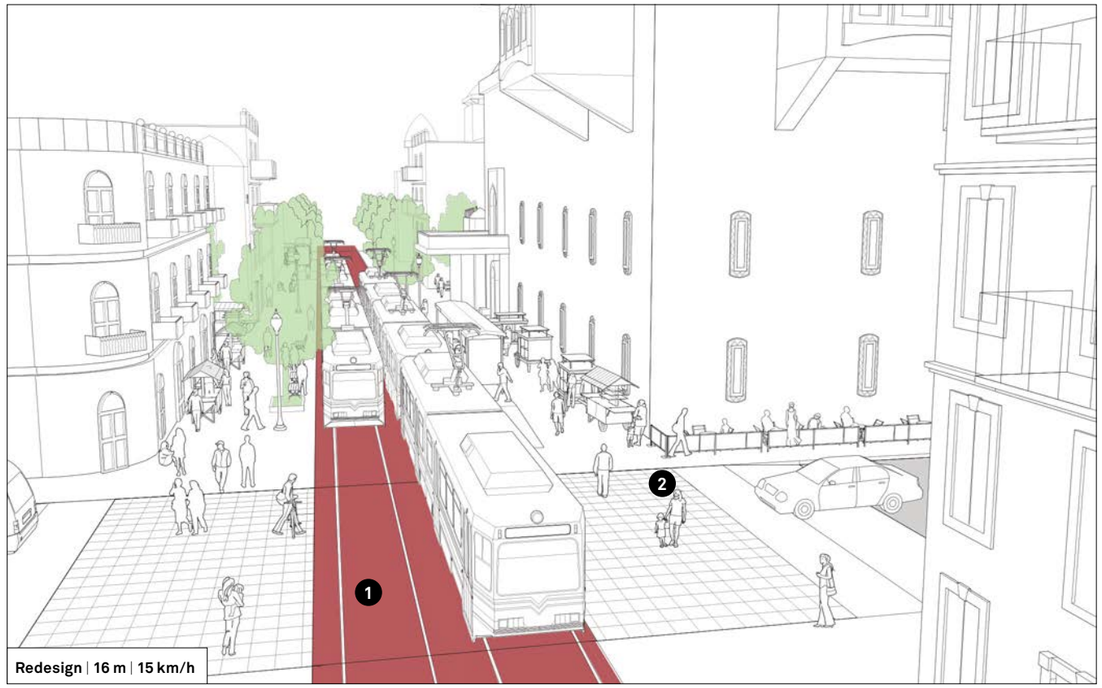
These streets might bustle with commercial activity and pedestrians, but users are subject to unsafe conditions due to a combination of crowded sidewalks, traffic congestion, and missing crosswalk markings.

Travel lanes accommodate mixed vehicular traffic and collective transport, and are often congested.

This street has narrow sidewalks that are insufficient to allow commercial activity and heavy pedestrian volume to coexist without conflicts.

Redesign iRAP Star Rating

Street Only



Redesign | 16 m | 15 km/h

NACTO-GDCI Design Guidance

When street space is restricted, transit and pedestrians are prioritized. When more space is available, additional pedestrian-priority space and wider sidewalks are encouraged, allowing a range of activities, landscaping, and street furniture.

1 Restrict all vehicular access. Add accessible and grade-level, center-running mass transit to give the street a shared quality and to ensure pedestrian priority.

Treat the street as a shared zone to expand the pedestrian realm and increase permeability across the street.

Add side-boarding transit stops at wider sections of the street. Construct accessible platforms that enable fast and easy transit boarding. *See 6.5.5: Transit Stops.*

2 Raise intersections to the transit grade where the transit street intersects with cross streets for continuous pedestrian access. Provide a change in pavement markings, pattern, or color to indicate areas where vehicles cross the street.

Add trees and native landscaping where width allows. Street furniture and vendors may be encouraged where possible but a clear path for pedestrians must be maintained.

Loading and deliveries must be permitted only during off-peak hours. *See 8.5: Volume and Access Management.*

Transit Streets | 32 m

Existing Conditions iRAP Star Rating

Street Only

Existing | 32 m | 50 km/h

Existing Conditions Description

The street illustrated above plays an important role in the city's network, connecting commercial hubs to neighborhoods with a center-running transit spine. At times, transit is physically separated to increase efficiency.

This two-way street has two travel lanes in each direction with medium traffic volumes and high pedestrian activity.

Pedestrian access across the street is allowed at designated, but limited, points where crossings are not universally accessible.

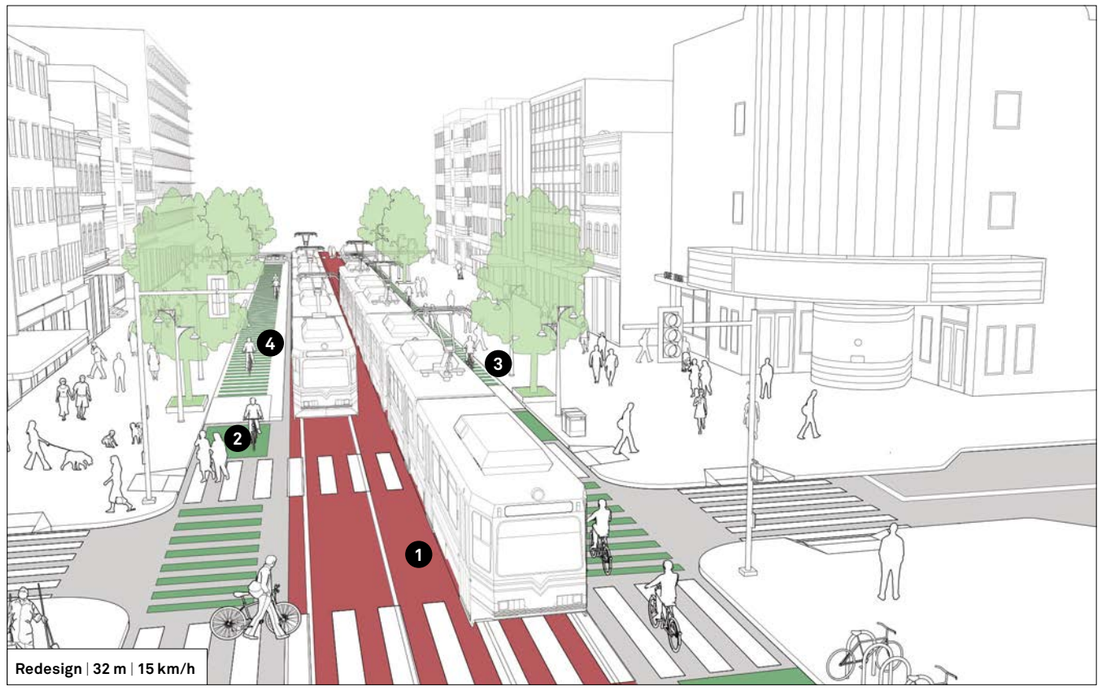
Pedestrians spill onto the roadbed due to limited space for commercial and pedestrian activity.

Transit riders face difficulty in crossing multiple travel lanes to get from the transit stop on the central median to the sidewalk.

Frequent curb cuts result in multiple turning and weaving conflicts, rendering the street unsafe for cyclists.

Redesign iRAP Star Rating

Street Only



Redesign | 32 m | 15 km/h

NACTO-GDCI Design Guidance

Reconfigure this street to re-establish it as an important commercial corridor. Restrict or filter through-traffic and separate transit, cycle, and pedestrian zones within the right-of-way. Prioritize stopping-and-staying activities.

1 Improve center-running mass transit by raising the roadbed at the transit stops to increase boarding efficiency and accessibility. *See 6.5.4: Transit Facilities.*

Vehicle traffic may be fully prohibited, restricted to certain times of day, or required to turn off after one or two blocks to manage volume and preserve pedestrian and transit priority.

Provide dedicated space within the curb zone to accommodate trees, street furniture, vendors, cycle racks, and other elements.

2 Add dedicated cycle lanes on both sides of the street. Separate cyclists at transit stops and provide two-stage turns at intersections to ensure cyclists do not cross in-street rails except at near 90-degree angles. *See 6.4.4: Cycle Facilities.*

Provide a minimum buffer of **0.5 m** from transit in each direction to avoid conflicts between cyclists and passengers boarding the transit.

3 Place transit stop amenities behind the cycle lanes to offer shelter for passengers while maintaining a continuous clear path for cyclists. *See 6.4.4: Cycle Facilities.*

4 Where cycle lanes encounter transit stops, ramp lanes up to sidewalk level to allow accessible transit boarding. Provide distinct markings on cycle lanes at transit stops to indicate crossing paths with transit passengers.

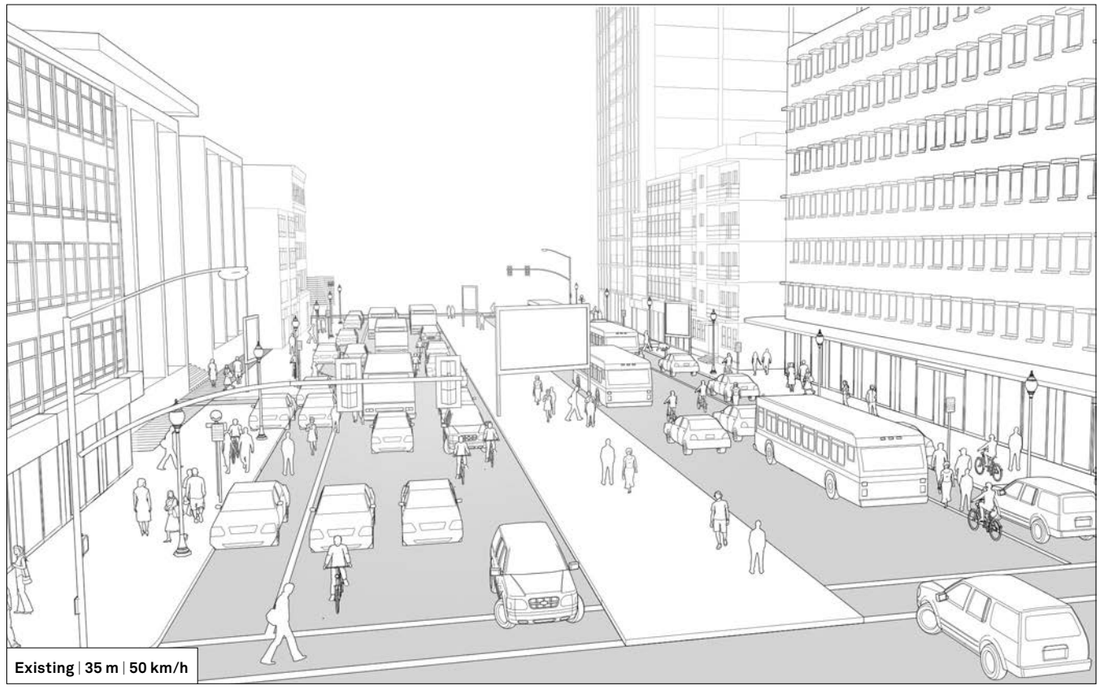
Restrict loading and deliveries to off-peak hours.

Transit Streets | 35m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 35 m | 50 km/h

Existing Conditions Description

The illustration above depicts a wide two-way street that connects central business districts, downtown areas, institutional centers, and residential neighborhoods. Long, continuous corridors become increasingly congested as they approach central areas, progressively collecting regional commuters.

This street supports local and through-traffic along with major bus routes. Private motor vehicles, taxis, and informal collective transport all demand curbside space, resulting in frequent double-parking, blocked transit stops, and unsafe cycling conditions, as well as delayed transit service.

Billboards and signage on sidewalks reduce visibility at intersections.

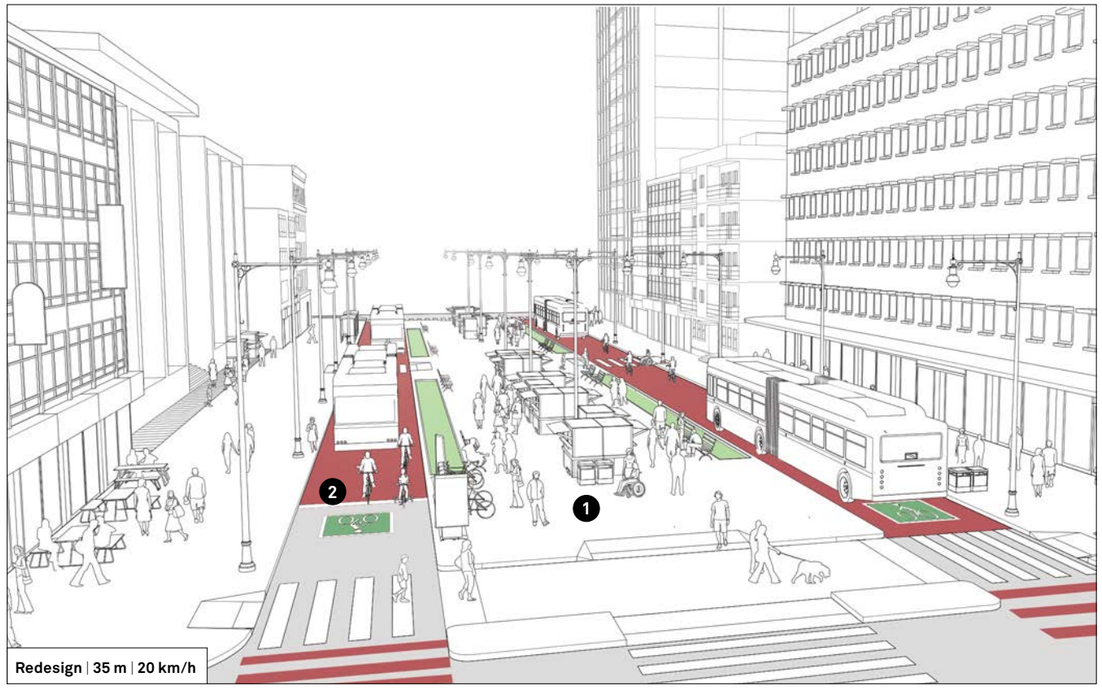
Narrow sidewalks inhibit commercial activity and cause conflict with transit stops and heavy pedestrian use.

Long crosswalks increase pedestrian crossing time, and raised medians with no ramps render the crossings inaccessible.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 35 m | 20 km/h

NACTO-GDCI Design Guidance

1 Redesign the street to provide a widened central median that serves as a public space with trees, benches, lighting, street vendors, cycle share, water fountains, and public amenities.

Remove private vehicle access to prioritize pedestrians, transit, and cyclists. Frequent, reliable transit service can serve far more users than private vehicles, with significantly improved safety and comfort for pedestrians and cyclists.

2 Dedicate lanes for transit with low speeds, shared with cyclists and taxis. Provide transit shelters on the widened central median or the sidewalk furniture zone depending on transit vehicle door alignment. Maintain the pedestrian clear path when locating transit shelters and stops.

Widen sidewalks to provide universal accessibility and increase space for pedestrians and commercial activity.

Allow for loading and deliveries only during off-peak hours.

Add green infrastructure along the central median and the sidewalks to support stormwater management and create a more appealing environment. *See 7.2: Green Infrastructure.*

Large Streets with Transit | 32m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

Existing | 32 m | 60 km/h

Existing Conditions Description

The two-way street condition shown in the illustration above prioritizes through movement. Three wide travel lanes in each direction accommodate mixed traffic and encourage speeds that are inappropriate for urban conditions. Transit routes suffer frequent delays caused by traffic congestion and slow curbside boarding.

Narrow and fenced sidewalks impede pedestrians from crossing the street along natural or desired paths, reinforcing a hostile walking environment. High volumes of pedestrian activity are funneled into a tight space.

Crosswalks are recessed from the intersections, increasing walking time and distances for pedestrians. Long crosswalk distances and inadequate refuge islands create unsafe conditions.

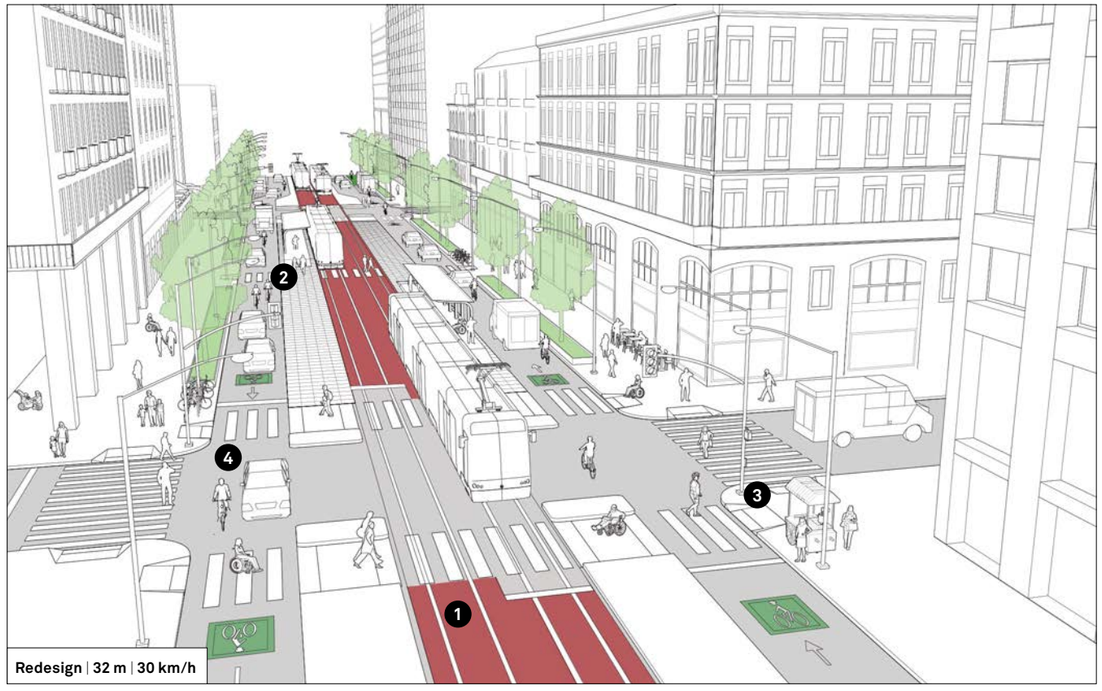
Cyclists ride on sidewalks where they conflict with pedestrians, or in mixed traffic, where they are forced to negotiate congestion and fast-moving vehicle traffic.

Heavy rains overload below-grade stormwater drainage, causing frequent flooding and ponding, especially at curb ramps and pedestrian access points.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 32 m | 30 km/h

NACTO-GDCI Design Guidance

This street provides an opportunity for increased capacity and improved public space through the introduction of mass transit, management of travel lanes, and additional pedestrian facilities.

1 Introduce a center-running light rail service to increase the total capacity and improve transit access at a regional scale.

Design transit stops to allow level boarding for universal accessibility.

2 Add mid-block crossings near the transit stops to reduce walking distances, with appropriate traffic controls. Provide transit shelters to create a comfortable waiting space, protected from the weather.

Widen sidewalks to improve accessibility and increase space for pedestrian and commercial activity. *See 6.3.4: Sidewalks.*

3 Eliminate fences and ensure frequent pedestrian crossings. Align crossings with sidewalks for a direct and continuous clear path.

4 Maintain one travel lane in each direction to be shared by cyclists and motorists. Provide parking spaces and loading bays on blocks with no transit stops.

Turns across oncoming traffic are a common cause of conflict and should be carefully managed. Turns across the transit lane create conflicts and slow transit operations. Left turns should either be prohibited or managed in separate turn lanes with protected signal phases. Especially in dense street grids, turns may be rerouted to non-station blocks or through the grid. *See 8.8: Signs and Signals.*

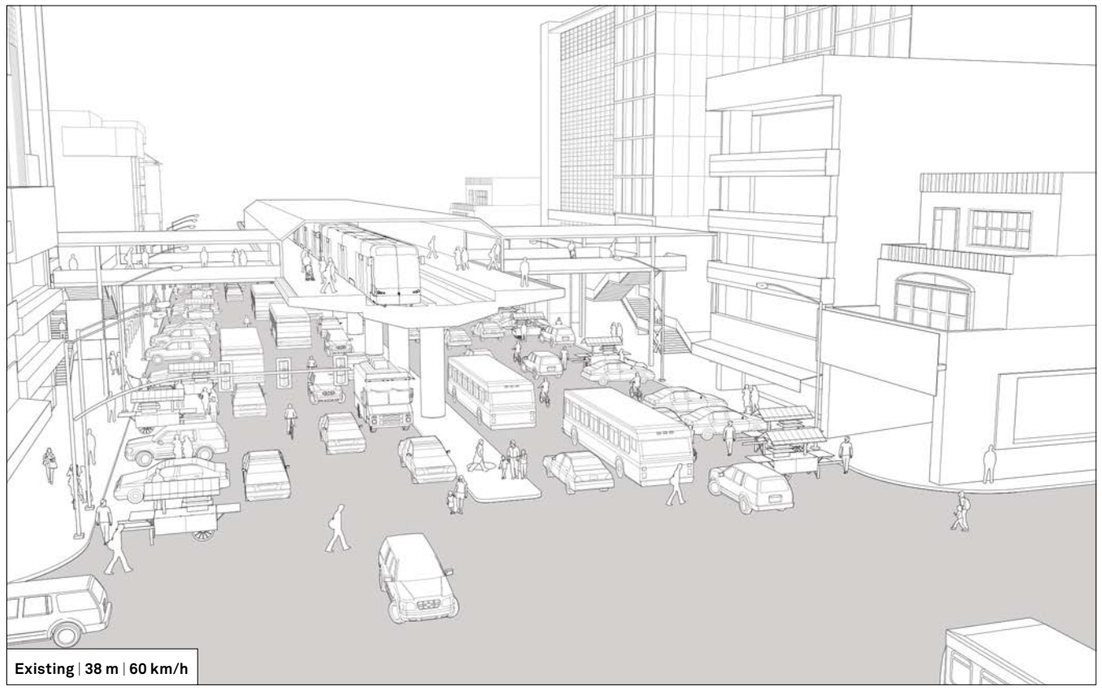
Add green infrastructure such as bioswales, rain gardens, and connected tree pits and trenches to better manage stormwater runoff and recharge the water table. Permeable surfaces like pavers and pervious concrete can be applied on lightly used surfaces—such as pedestrian spaces—to supplement stormwater management, so long as materials are kept clean of debris and blockages.

Large Streets with Transit | 38m

Existing Conditions iRAP Star Rating

Street Only

The Intersection

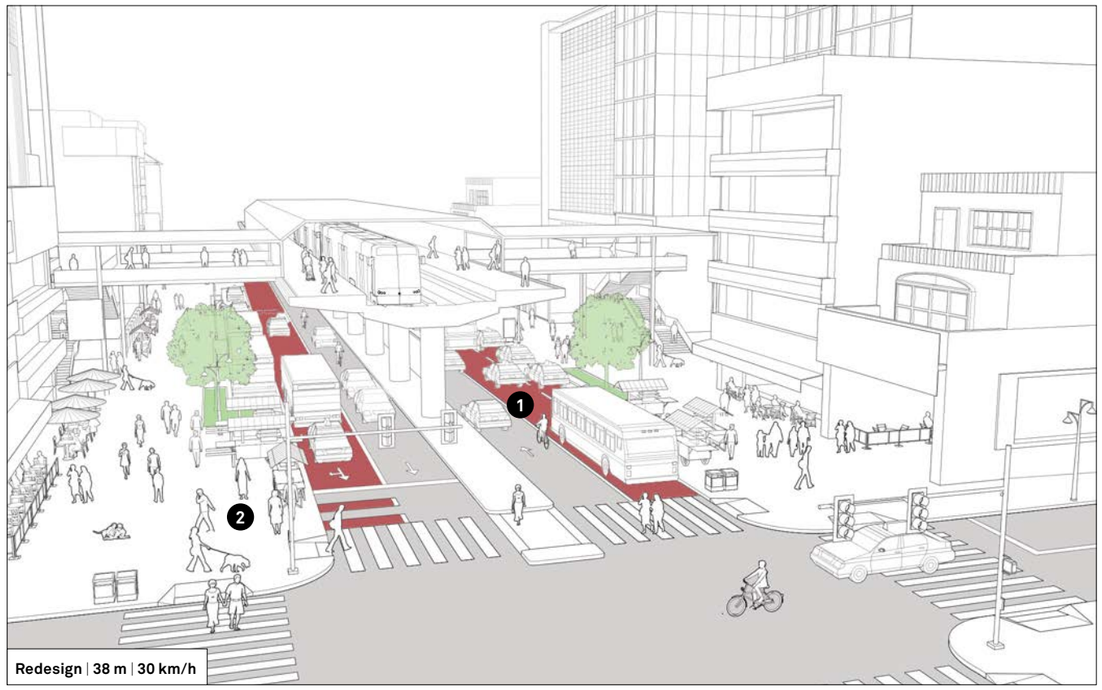


Existing | 38 m | 60 km/h

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 38 m | 30 km/h

Existing Conditions Description

This street depicted in the illustration above has elevated transit infrastructure. It provides regional connectivity and a variety of collective transit options. The elevated transit stop serves as a multimodal exchange point, but at-grade collective transport has poor reliability due to shared travel lanes and heavy congestion.

Collective transport passengers are faced with poorly marked stops and disorienting transfer spaces.

Undefined areas along the sidewalks are occupied by street vendors, rickshaws, and unregulated car and motorcycle parking that force pedestrians onto the roadbed.

High speeds, long crossing distances without clear markings, and narrow, non-continuous, and inaccessible sidewalks create an unsafe pedestrian environment.

Utilities and elevated transit infrastructure often block clear pedestrian paths and limit visibility.

NACTO-GDCI Design Guidance

The street is redesigned to prioritize transit and shared mobility, improve walking conditions and public space, and transform key transfer nodes into recognizable landmarks.

1 Eliminate excess traffic lanes and designate a curbside transit lane in each direction. Marked transit lanes may be shared with taxis and small collective transport. To ensure smooth operation of collective transport services, provide pull-in and drop-off stops for boarding, which allows other transit vehicles to pass. These alternate with accessible parking spaces and taxi stands. *See 6.5.4: Transit Facilities.*

Widen sidewalks and provide universal accessibility to better serve the needs of heavy pedestrian volumes.

2 Extend the curb to create dedicated areas for vendors in the same zone as pull-in lanes, ensuring a clear path for pedestrians.

Extend the central median to create pedestrian refuge islands. *See 6.3.6: Pedestrian Refuges.*

Provide signage and wayfinding for transit stops to help navigate the users and to identify transit routes.

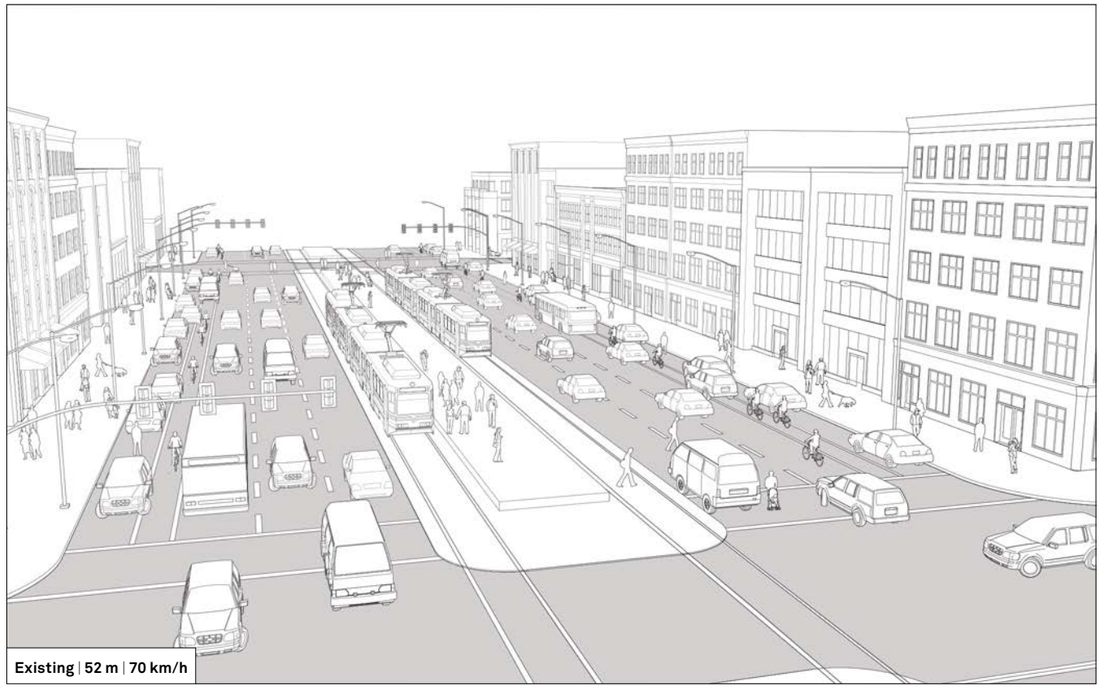
Add street furniture and trees to provide a comfortable street environment. *See 6.3.3: Pedestrian Toolbox.*

Grand Streets | 52m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 52 m | 70 km/h

Existing Conditions Description

The illustration above depicts a major street with center-running transit and unprotected cycle lanes. It serves as an arterial corridor with three wide lanes for fast-moving traffic in each direction. This street connects the city across multiple neighborhoods and regionally.

Safety issues for vulnerable users are increased by long crosswalk distances and poorly defined and recessed crosswalks that increase crossing time.

Sidewalks are wide. However, a lack of landscaping and ground-level activities render them uninviting and dull spaces.

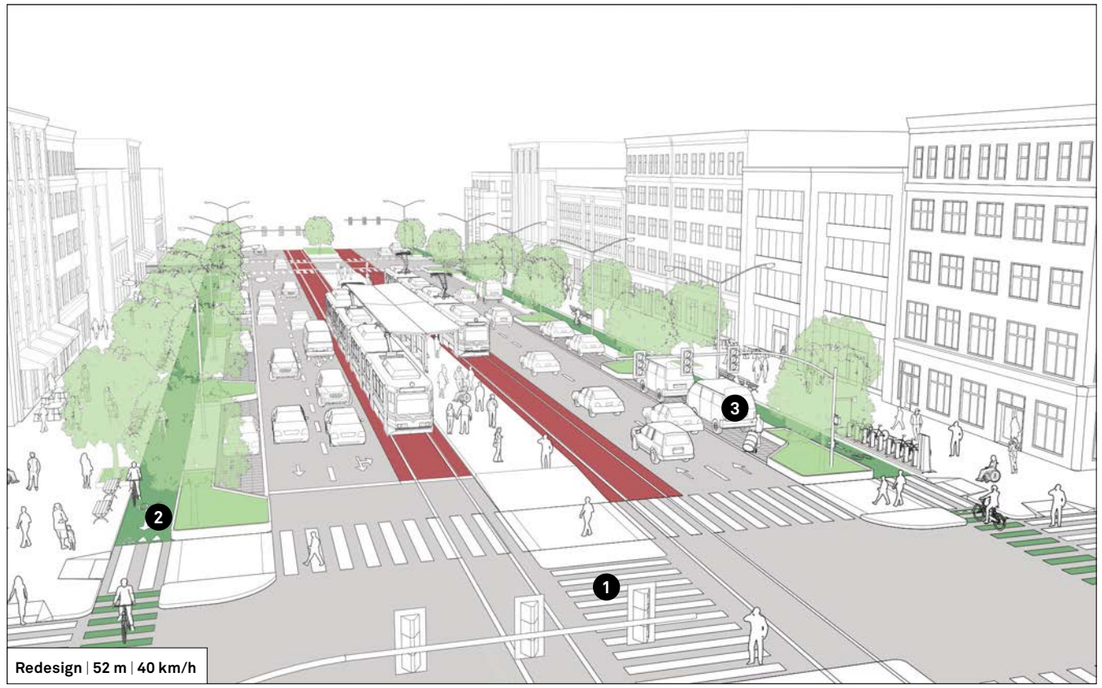
Center-running and center-loading mass transit has restricted entry and exit points. Stops might lack proper accessibility features.

Double-parked freight vehicles create weaving conflicts and safety hazards at peak hours for motorists and cyclists.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 52 m | 40 km/h

NACTO-GDCI Design Guidance

Delineate and demarcate different modes to efficiently share and manage the street.

Enhance the centre-running transit lanes through distinct paving or color treatments. Provide level boarding platforms, accessible ramps and paths, as well as audible and tactile features.

1 Add controlled mid-block crossings at transit stops to facilitate safe crossing from both sides of the street. Cover transit stops to provide a sheltered and comfortable waiting space.

Install refuge islands on the central median and curb extensions to shorten the overall crossing distance.

Encourage commercial activity and street vendors on wide sidewalks. Add street furniture and landscaping while maintaining a continuous pedestrian clear path.

2 Replace one travel lane in each direction with a parking-protected cycle track to encourage cycling as a healthy and sustainable mobility choice. Cycle share stations may be sited adjacent to cycle tracks and near transit stations to accommodate first- and last-mile trips.

Install street trees and green infrastructure along parking-side medians to dissipate road noise, manage stormwater run-off, and improve the urban environment.

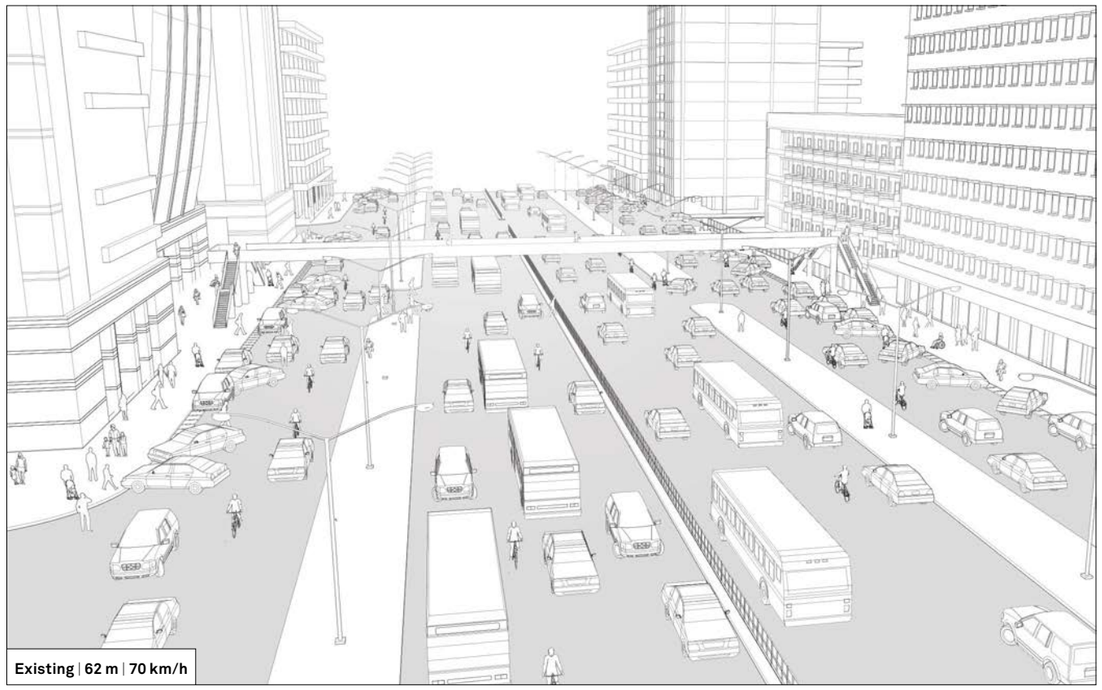
3 Provide loading zones at strategic locations within the parking strip. Restrict freight delivery or encourage off-peak delivery to eliminate double-parking obstructions. *See 6.7: Designing for Freight and Service Operators.*

Grand Streets | 62m

Existing Conditions iRAP Star Rating

Street Only (Central Roadway)

The Intersection (Central Roadway)



Existing | 62 m | 70 km/h

Existing Conditions Description

The large city street illustrated above carries fast-moving through-traffic in the central travel lanes and local traffic mixed with double parking in the side-running service lanes. A fenced median limits pedestrian cross-street access.

Collective transport operates in mixed traffic in the center through-lanes. Congestion reduces transit service quality and reliability. Transit riders wait on the side medians with no shelter or protection.

Irregular parking encroaches upon the sidewalk, constraining the already limited pedestrian space and reducing capacity for social and economic activities. Pedestrians are exposed to unsafe and harsh walking environments due to inaccessible and disconnected sidewalks, fast-turning traffic, lack of pedestrian crossings, and absence of landscaping and trees.

Fences on the central median, intended to restrict pedestrian behavior, often result in pedestrians crossing unsafely by jumping over or cutting through the fence.

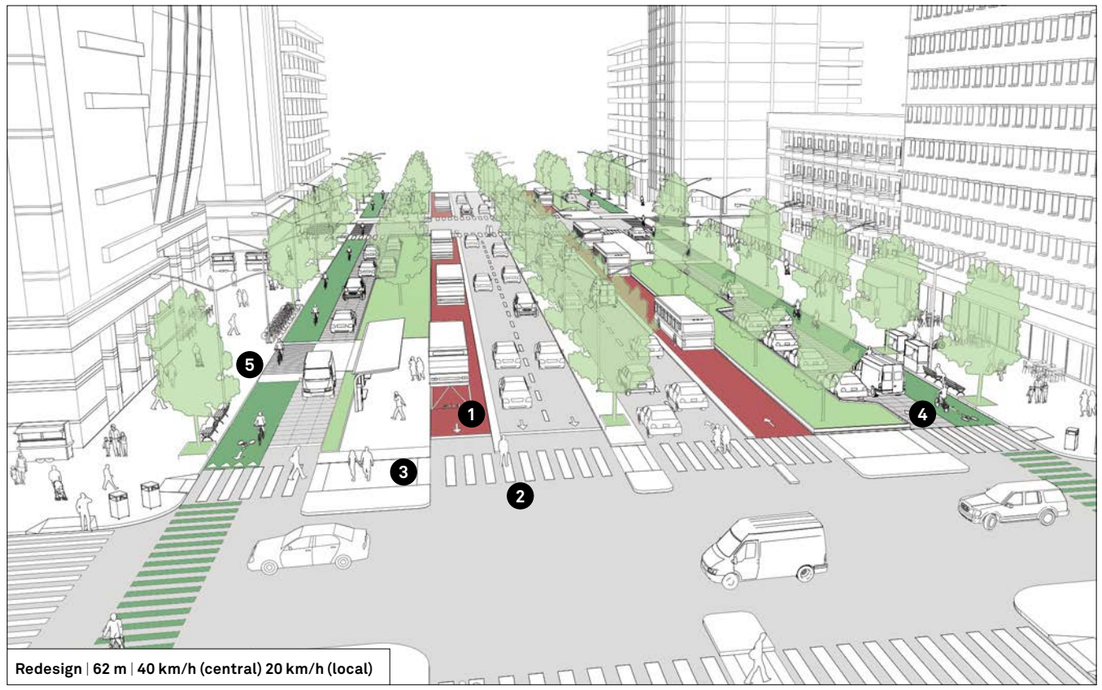
Crossings are grade separated by overhead foot bridges or underpasses that significantly add to pedestrian travel time and are not universally accessible.

Poor drainage infrastructure causes flooding during heavy rains, and open culverts create a safety hazard for vulnerable users.

Redesign iRAP Star Rating

Street Only (Central Roadway)

The Intersection (Central Roadway)



Redesign | 62 m | 40 km/h (central) 20 km/h (local)

NACTO-GDCI Design Guidance

Convert one travel lane in each direction into a dedicated transit lane, and widen the medians to introduce multiple refuge islands. This creates a safer street with a more efficient transit system.

1 Provide a fully separated bus lane in a dedicated transitway with curb separation. At moderate to frequent headways, the transitway vastly improves average transit speed and reduces travel time variation.

Design transit stops as accessible boarding islands for increased efficiency and comfort. Install covered structures to provide a sheltered and comfortable waiting space for passengers. *See 6.5.5: Transit Stops.*

2 Add ground markings and low dividers to distinguish and separate transit lanes from other traffic. When occasional vehicle access into the transit lane is needed, use low vertical separation elements such as mountable curbs. To permanently prevent access into the transit lanes, use prominent vertical elements like bollards, which require added width. Provide additional enforcement while traffic behavior adjusts to new configurations.

Widen sidewalks and medians to provide universal access and increase space for pedestrian and commercial activity.

3 Install refuge islands to shorten the crossing distance for pedestrians and provide frequent at-grade signalized crossings to allow pedestrians to safely and conveniently cross the street. *See 6.3.6: Pedestrian Refuges.*

Manage cross-traffic turns to improve the safety and reliability of the through-lanes by removing conflicts and speed differentials.

4 Convert service lanes to slower, pedestrian and cycle-friendly streets at 20 km/h with a cycle lane in each direction. *See 9.1: Design Speed.*

5 Raise crossings for service lanes at the intersections to allow safe access from the sidewalk to the transit stop.

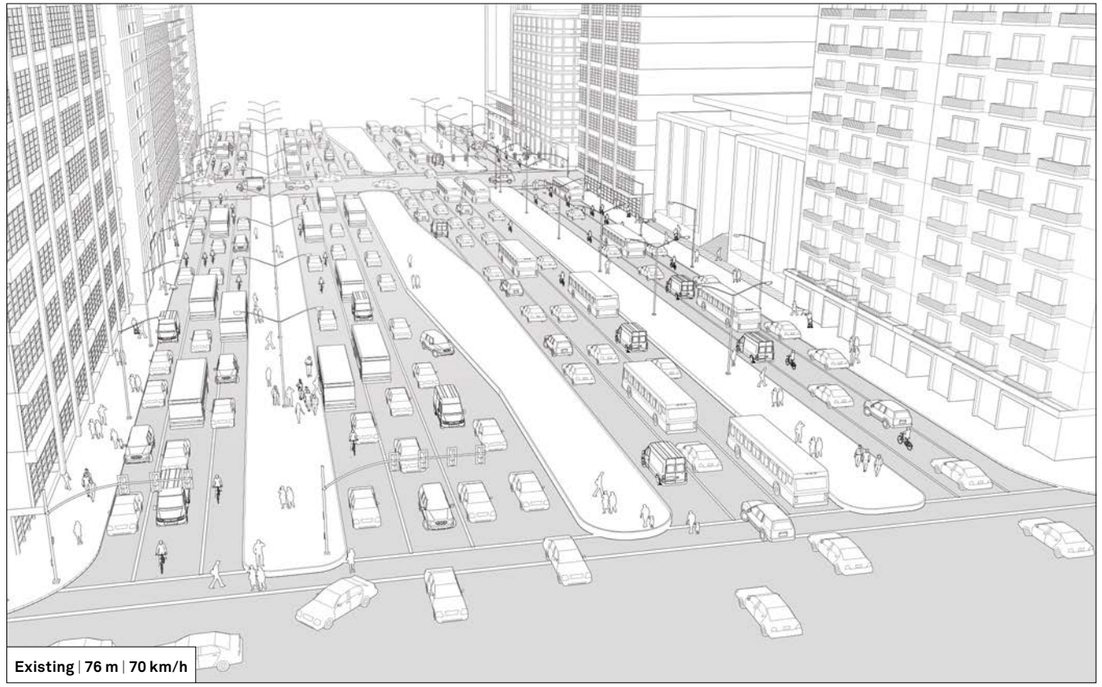
Add trees and landscaping to provide shade, reduce the urban heat island effect, capture stormwater, and improve the air quality.

Grand Streets | 76m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing | 76 m | 70 km/h

Existing Conditions Description

The large street depicted in the illustration above carries high-speed traffic in the center, separated by medians from slower service lanes on both sides. This type of street is prone to collisions where turning vehicles cross service lanes.

Such streets form a dangerous barrier between adjacent neighborhoods and limit access for many residents.

Long distances between pedestrian crossings and limited cross-street access increase traffic speed and funnel more vehicles onto the service lanes.

Local buses use congested service lanes or dangerous center lanes, with passengers waiting on medians without protection or shade.

Extremely long crossing distances require extended signal-cycle lengths, which create delays for all users. Pedestrians are exposed to dangerous traffic conditions while waiting mid-crossing.

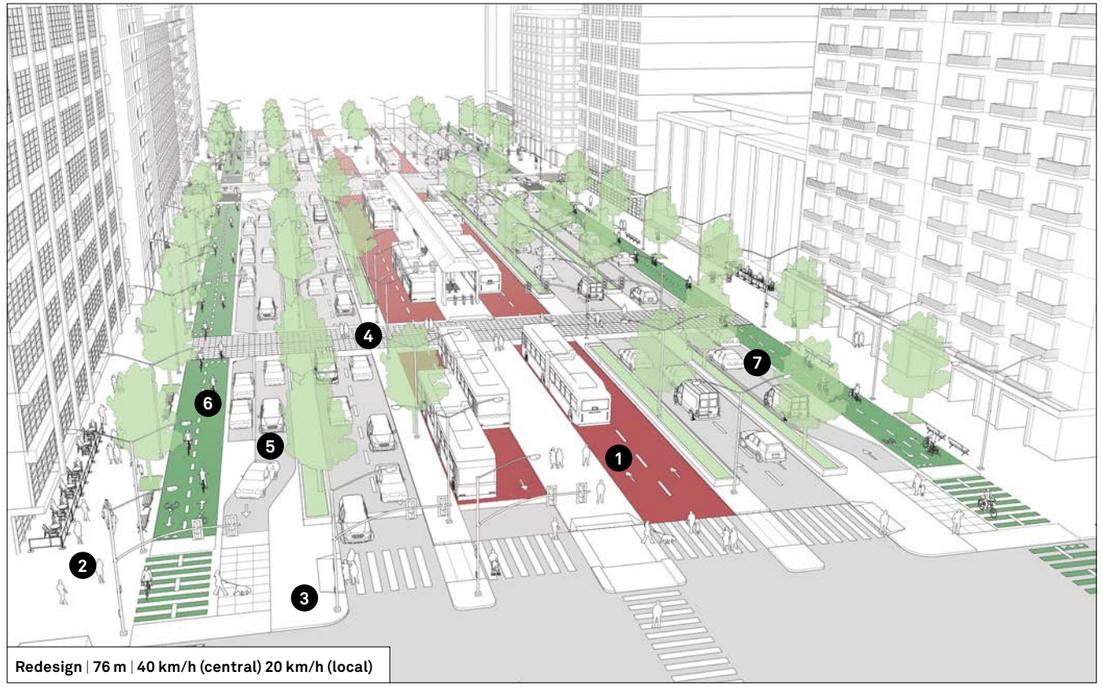
In the absence of dedicated facilities for loading and parking, cycles share mixed travel lanes and compete for space with cars, trucks, and buses, leading to an unsafe cycling environment.

Turns from the central lanes block through-traffic and can result in right-angle crashes.

Redesign iRAP Star Rating

Street Only

The Intersection



Redesign | 76 m | 40 km/h (central) 20 km/h (local)

NACTO-GDCI Design Guidance

Extremely wide streets should not be built in new developments. Existing conditions can be improved by the introduction of a transit spine, better management of the central lanes, and added cycle facilities.

1 Introduce a center-running Bus Rapid Transit (BRT) or light rail to increase the capacity of the street and to improve regional transportation. Passing lanes at stations allow more frequent and tiered transit service, with capacity for multiple routes. *See 6.5.4: Transit Facilities.*

2 Widen sidewalks to provide increased space for pedestrians, street furniture, and commercial activities.

3 Provide curb extensions and refuge islands to shorten crossing distances and create a safer environment for pedestrians.

4 Add raised mid-block pedestrian crossings to provide convenient access to and from transit stops. *See 6.3.5: Pedestrian Crossings.*

Manage vehicle turns by signalizing turns across traffic. Change traffic signal timing to create a reliable and reasonable speed throughout the corridor. By reducing speed differentials, injury risk is significantly reduced.

5 Convert service lanes to slower speeds of 20 km/h, raised at intersections to encourage yielding. Use distinctive paving and shade trees to help calm these lanes.

6 Add bidirectional parking-protected cycle tracks on both sides of the street to provide high-comfort mobility and safe access for cyclists. *See 6.4.4: Cycle Facilities.*

7 Designate loading zones in the service lanes.

Adding trees, plants, and landscape elements to sidewalks and medians provides shade, reduces the urban heat island effect, improves local air quality, and helps reduce the burden on stormwater infrastructure.

Elevated Structure Improvement | 34 m

Existing Conditions iRAP Star Rating

Existing Conditions Description

The illustration above depicts a street condition with an elevated structure carrying multiple lanes of traffic.

Elevated structures, such as fly-overs, overpasses, highways, viaducts, and rail lines, have been built in many cities to avoid signalized intersections and reduce waiting time for fast-moving, motorized through-traffic or transit. In attempting to serve the needs of vehicles on the elevated structure above, cities have created uninviting spaces for users at the street level.

Below the elevated structure, a two-way street with wide travel lanes is separated by a wide median that supports the elevated structure's foundation.

The space under the elevated structure provides shade and protection from the rain, but is dark and unsafe. It may be used as regulated or unregulated parking and collects waste due to a lack of maintenance or stewardship.

Redesign iRAP Star Rating

NACTO-GDCI Design Guidance

Avoid investments in new elevated structures when they only serve a singular purpose. Opportunities for improvements should be identified throughout the city where these structures exist.

This reconstruction responds to the reallocation of space at grade, while the elevated structure remains in place.

1 Improve the safety and character of the space by introducing active uses underneath the elevated structure, such as pop-up stores, markets, cafés, and active recreation equipment.

2 Add lighting, colors, and surface treatments. When noise levels are high, install sound-reducing panels, acoustic ceilings, or buffers to mitigate noise pollution.

Redesign travel lanes in both directions to allow for wider sidewalks and new cycle facilities.

Add trees and green infrastructure elements to improve the quality of the streets and provide public health and environmental benefits, such as cleaner air, reduced heat island effect, and better stormwater management. *See 7.2: Green Infrastructure.*

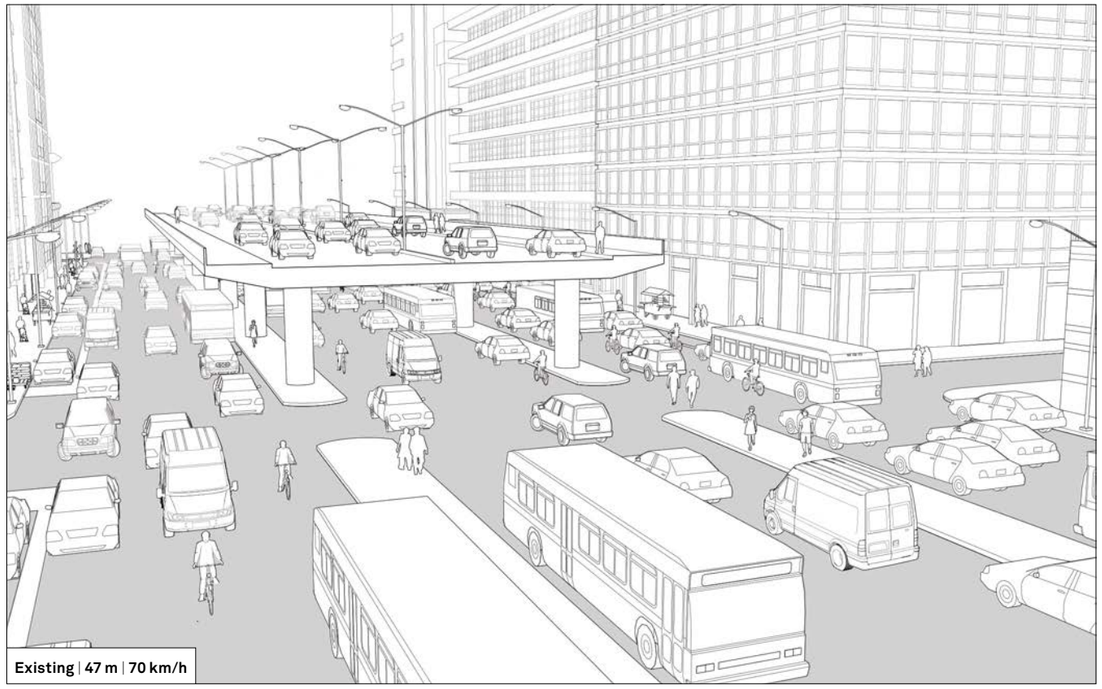
Add mid-block crossings to increase and improve access to the newly activated central spaces. *See 6.3.5: Pedestrian Crossings.*

Introduce median-to-median crossings to position the spaces as a continuous mall.

Elevated Structure Removal | 47 m

Existing Conditions iRAP Star Rating

Central Roadway



Existing | 47 m | 70 km/h

Existing Conditions Descriptions

The illustration above depicts a wide elevated structure that dominates, the street and carries six lanes of traffic.

At grade, this urban street serves fast-moving through-traffic with service lanes, central travel lanes, and on-street parking. Motorists, cyclists, and transit operate in traffic with frequent conflicts due to differences in operating speeds.

Medians that carry the structure of the elevated road divide the service lanes from the central lane and block the pedestrian crossing.

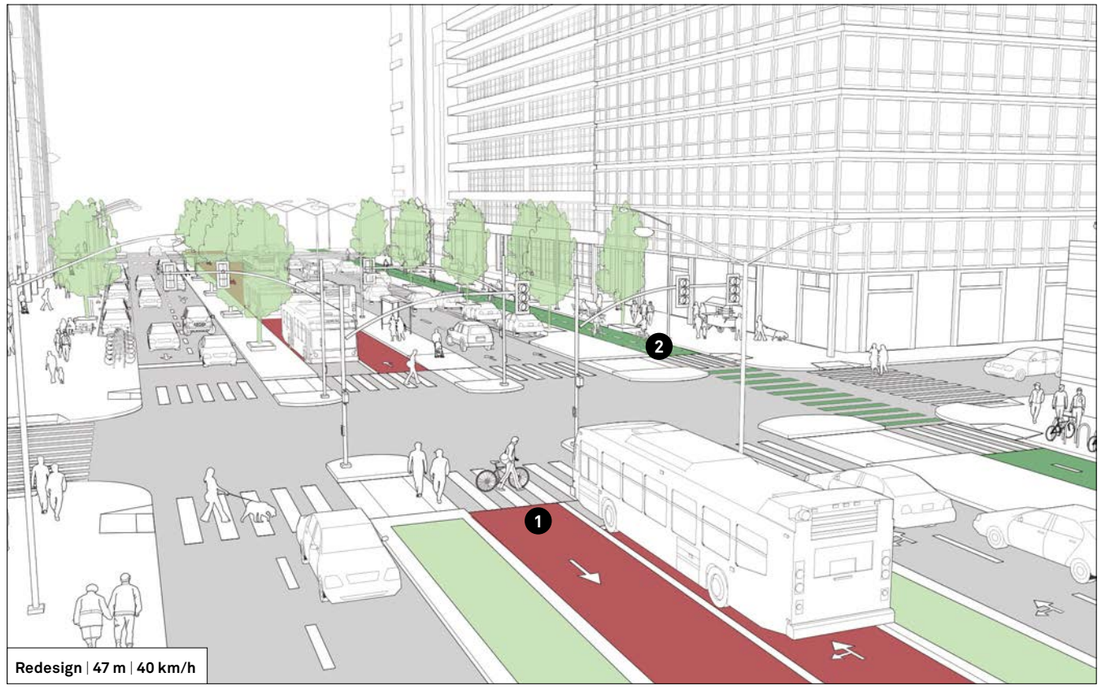
A lack of marked pedestrian crossings and long distances make it impossible for pedestrian to cross the street without risking conflicts with moving vehicles.

Large structural elements severely limit visibility.

Narrow sidewalks are filled with obstacles, forcing pedestrians to walk on the street in unsafe conditions.

Redesign iRAP Star Rating

Central Roadway



Redesign | 47 m | 40 km/h

NACTO-GDCI Design Guidance

The elevated structure is removed to create an equitable street for multiple users. Accommodating transit lanes increases the street's capacity. Cycle facilities and an improved pedestrian realm result in safer and more-comfortable experiences for walking and cycling.

1 Add dedicated, center-running transitway with wide medians that serve as transit boarding areas, pedestrian refuge islands, and green infrastructure opportunities. *See 6.5.4: Transit Facilities.*

Maintain curbside parallel parking, adding curb extensions near intersections and mid-block crossings to shorten pedestrian crossing distances and maintain local business access.

2 Add a dedicated, bidirectional cycle track on one side of the street.

Widen sidewalks to help revitalize building frontages and attract new commercial uses. Provide space for street vendors. *See 6.3.4: Sidewalks.*

Add trees and landscaping to sidewalks to improve air quality, stormwater management, and to provide shade.

Streets to Streams | 40 m

Existing Conditions iRAP Star Rating

Side Roadway

Central Roadway

Existing | 40 m | 60 km/h

Existing Conditions Description

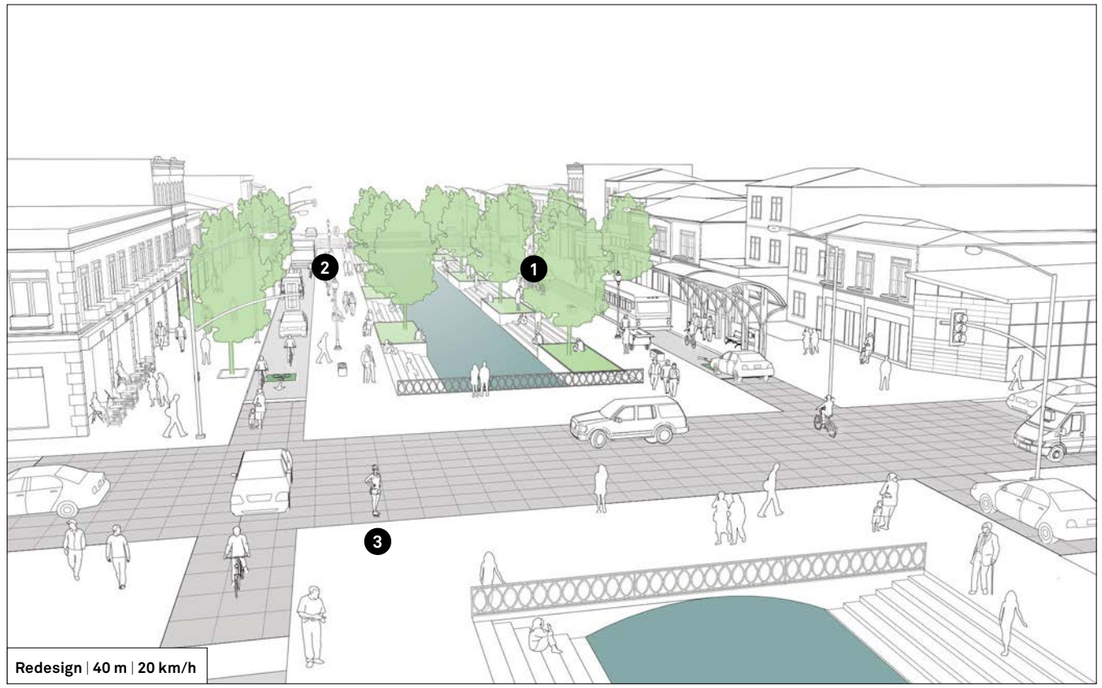
The illustration above depicts a two-way street with central travel and service lanes located above a channelized natural waterway.

Streams and rivers are often polluted by industrial and residential uses and are deemed to be in the way of new development. They are often channeled into underground pipes and paved over. Today however, cities around the world are looking to rebalance the relationship they have with their natural environment.

Redesign iRAP Star Rating

Side Roadway

Central Roadway



Redesign | 40 m | 20 km/h

NACTO-GDCI Design Guidance

Overlay historic hydrology maps of the city with current street plans to identify natural watercourses. Consult environmental agencies, and advocacy groups, as well as planning and transportation agencies about known rivers, streams, or street-channeling projects implemented in past decades. *See 1.4: Streets for Environmental Sustainability.*

Identify daylighting sites by considering areas suffering from frequent flooding, or neighborhoods lacking in public open space.

Collect drawings, maps, and data to analyze the detailed right-of-way dimensions, traffic flow, constructed buildings, hydrology, and other existing conditions.

Discuss the potential pedestrianization of the street and daylighting concept with local officials and communities, bringing examples from other places to help demonstrate the multiple benefits. *See 2.5: Communication and Engagement.*

Consider a temporary closure of the relevant street sections, and program events to increase public awareness and build community interest. *See 10.7.4: Temporary Street Closures.*

Work with experts to develop a strategic plan, action items, engineering, and budgets for the proposal. Work with local artists and designers to visualize the potential transformation.

1 Add public seating to invite people to use the new water's edge.

2 Specify plant species that are durable and compatible with the local climate, soil conditions, and annual rainfall. *See 7.2.1: Green Infrastructure Design Guidance.*

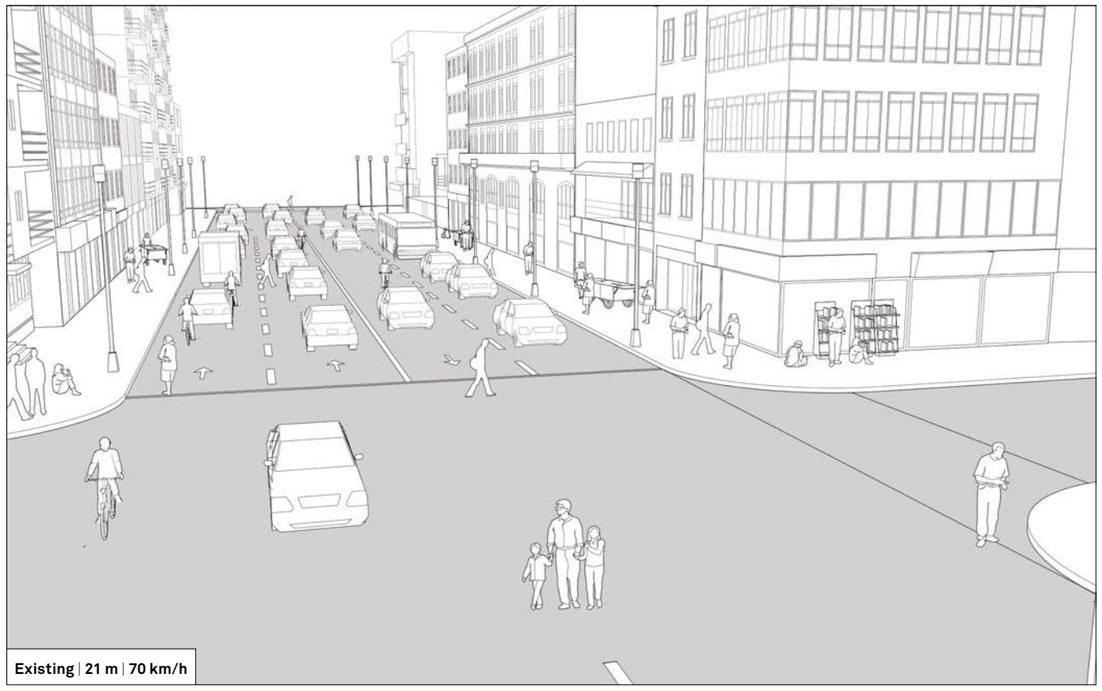
3 Use permeable pavers over adjacent pedestrian areas to increase water infiltration.

Measure and document environmental benefits such as groundwater recharge.

Create a pedestrian-friendly environment with raised intersections and continuous pedestrian crossings to slow traffic.

Temporary Street Closures | 21 m

Existing Conditions iRAP Star Rating



Existing Conditions Description

Depending on a street's usage and characteristics, temporary closures can take multiple forms, emphasizing active recreation and exercise, commercial activity or food festivals, or celebrating local art and culture.

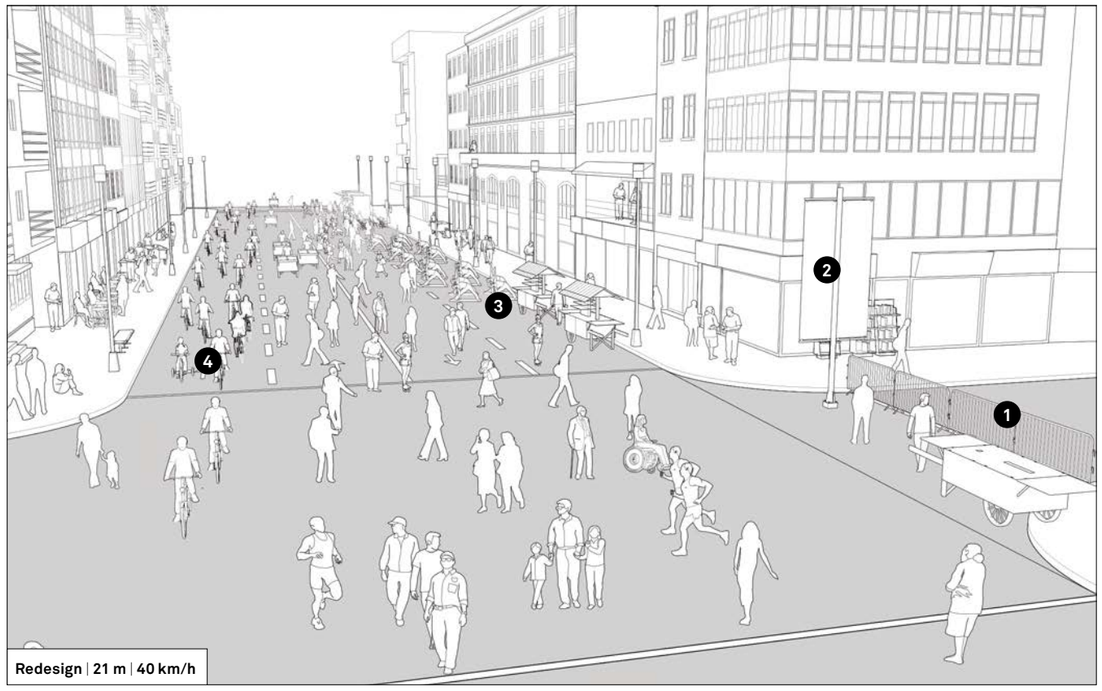
When closed to traffic and supported by activities and programs, the street provides additional reasons for neighbors to socialize and for children to play, building stronger communities.

When occurring on a regular or longer-term basis, temporary street closures can offer an opportunity to promote larger public health goals that encourage people to be more physically active, while simultaneously supporting environment-friendly goals that promote cleaner modes of transportation.[13]

Data collection can help document and communicate the benefits of temporary street closures, and ultimately help advocate for more permanent changes.

Temporary closures can produce different amounts and types of waste, requiring additional cleaning services.

Redesign iRAP Star Rating



NACTO-GDCI Design Guidance

Street Selection. When large areas are being closed to traffic, streets should be carefully considered within the larger network and clearly communicated in advance of the event. Select streets that benefit multiple neighborhoods. *See 6.3.2: Pedestrian Networks.*

Destinations. Smaller street closures of a few city blocks can add open space to adjacent destinations such as schools, transit stops, and museums. *See 5: Designing Streets for Place.*

1 **Enforcement.** While police enforcement may prove helpful, it is not always necessary or desirable. A temporary control device or barrier should be used to ensure that vehicles do not enter the space.

2 **Signage.** Where closures are weekly or daily, ensure that hours and days are clearly indicated on regulatory signage.

3 **Programming.** Closures are most successful when they are programmed with events and activities throughout the day. Programs may include performances, invited gatherings, food-related events, and other activities.[14]

4 **Cycles.** Allow cyclists to ride through temporary closures, yielding to pedestrians. Open Streets or Ciclovía events that follow longer routes should actively encourage cyclists by providing dedicated space and amenities.

Equipment and Amenities. Provide seating, tables, food stalls, recreational equipment, and lighting to help activate the space.

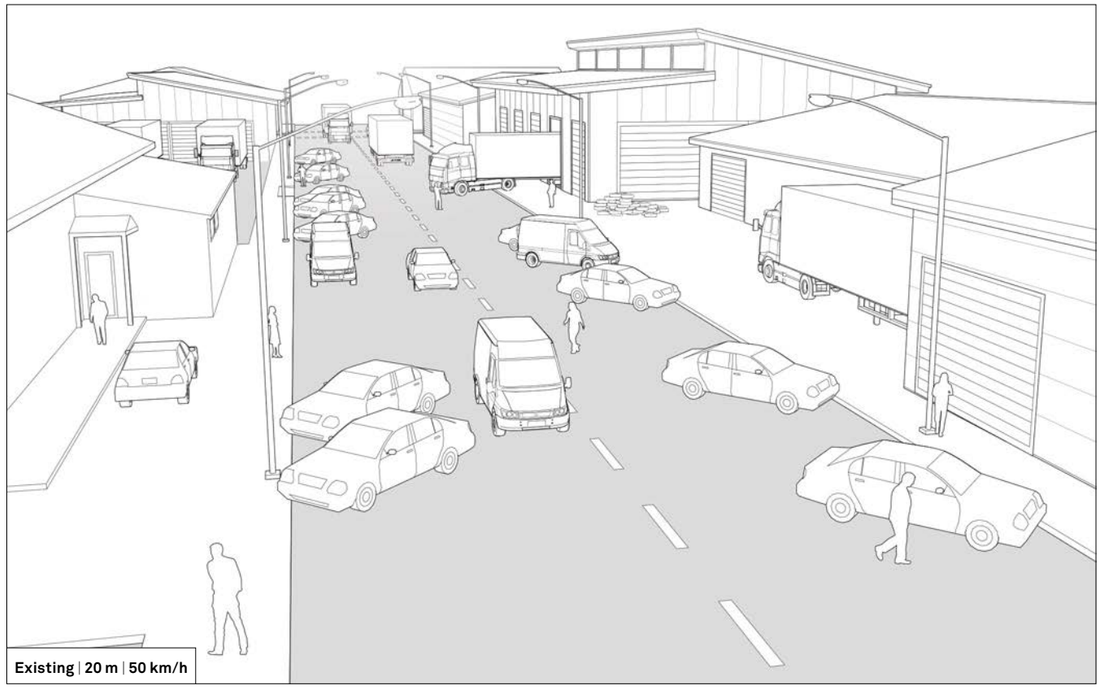
Loading. When streets are closed, arrangements should be made with local businesses for deliveries and unloading during morning and evening hours.

Branding. Consider local context and intended audiences and participants when branding and marketing these street projects.

Night Closures. Evening closures can allow events such as concerts, movie screenings, dining, and other activities. Additional lighting and police enforcement are recommended. Noise and other disruptions may be a consideration when locating these in residential neighborhoods.

Post-Industrial Revitalization | 20 m

Existing Conditions iRAP Star Rating



Existing Conditions Description

The illustration above depicts a wide street that runs through an underutilized industrial area where a new development is planned.

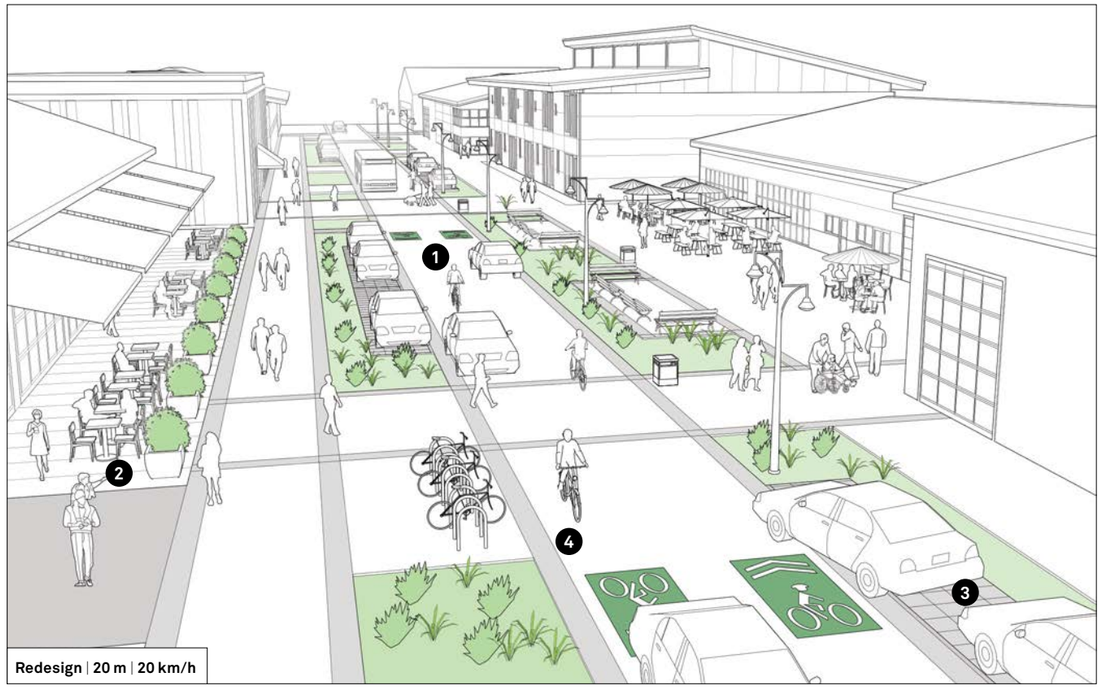
This two-way street contains two wide travel lanes in each direction, designed to accommodate large trucks. Perpendicular parking lines both sides of the street.

Traffic volumes are low, but vehicles travel quickly.

Sidewalks are narrow, inactive, or non-existent, and are lined with blank walls, loading docks, and fences.

These formerly industrial areas may be the target of extensive urban regeneration, potentially channeling significant private and public investment.

Redesign iRAP Star Rating



NACTO-GDCI Design Guidance

New uses attracted by building retrofits and zoning changes require these streets to be redesigned for multiple users. *See 5: Designing Streets for Place.*

Maintaining some of the industrial qualities is important in developing a distinctive character for the neighborhood.

A new transit service is provided in both directions, shared with mixed traffic.

1 Reduce the street width to a single travel lane in each direction, widen sidewalks, and provide green infrastructure. Bioremediation strategies can help to mitigate effects of past industrial uses and safely allow residential and commercial uses.

2 Include wide frontage zones on sidewalks, new development, and reused warehouses to support active sidewalks.

Add street furniture and public seating to enhance the pedestrian experience.

3 Provide parallel parking and loading spaces in small sections, alternating with rain gardens and trees.

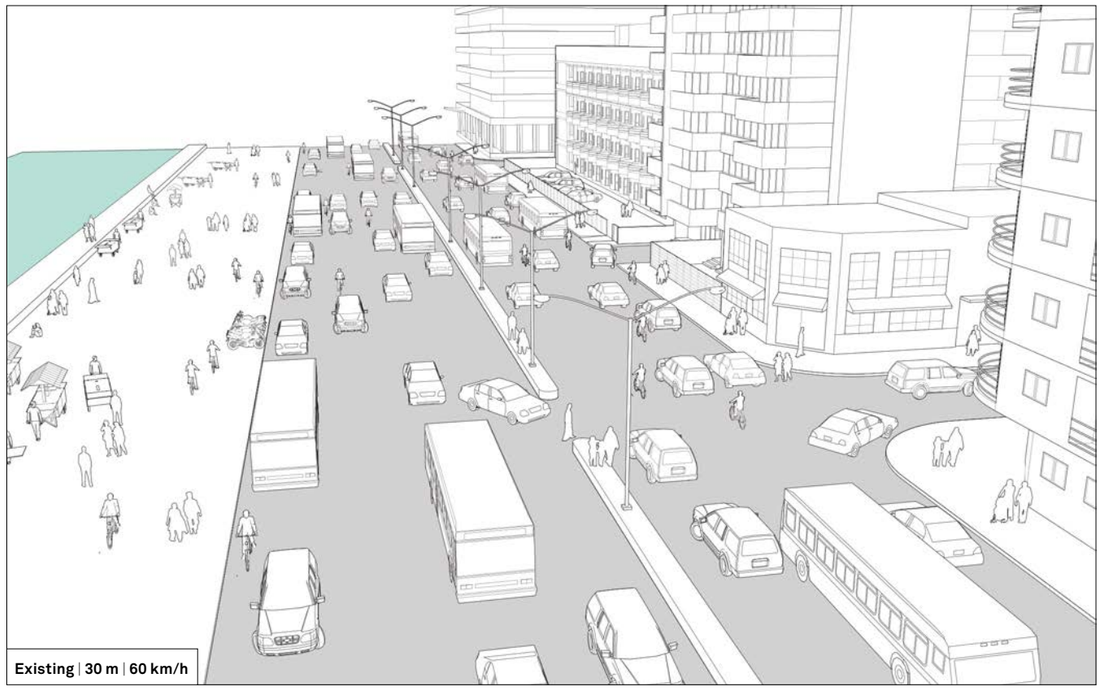
4 Develop the street as a shared space by removing curbs and markings, and reducing the width of the roadbed. Encourage active users to use the entire right-of-way and maintain low travel speeds. *See 10.4: Shared Streets.*

Waterfront and Parkside Streets | 30m

Existing Conditions iRAP Star Rating

Street Only

The Intersection



Existing Conditions Description

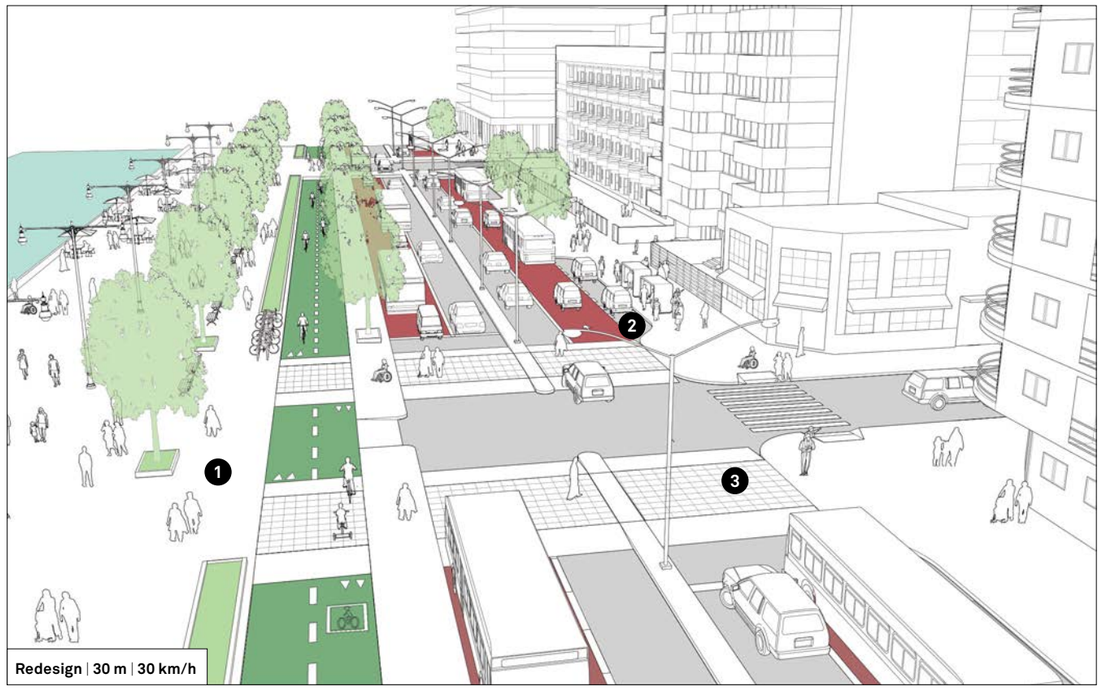
The illustration above depicts a two-way waterfront drive with four travel lanes in each direction, effectively severing the waterfront from the adjacent neighborhood.

Limited or no pedestrian crossings and narrow central medians create an unsafe pedestrian environment.

Redesign iRAP Star Rating

Street Only

The Intersection



NACTO-GDCI Design Guidance

Transform the waterfront or park edge into a vibrant public park and an active multimodal corridor. Provide wide, high-capacity cycle tracks, wide walking paths, and high-quality transit stops and service.

Design and install street lighting so that both the building and waterfront or park sides of the street are safe and well lit. The waterfront or parkside edge requires greater lighting and visibility consideration, as it likely receives little light or "eyes on the street" from active frontages. *See 7.3.1: Lighting Design Guidance.*

1 Reduce the number and width of travel lanes to widen park and promenade space.

Dedicate space for collective transport to increase the street capacity. Transit can be accommodated in a side-running transitway thanks to the lack of crossing conflicts.

2 Add taxi drop-off areas and selected parking areas for accessible parking. Locate these to minimize conflict with transit, cycle, or travel lanes.

Design specific gateways to access these destinations as safe intersections between all users.

Provide pedestrian refuge islands between the cycle tracks and transit lanes to shorten crossing distance.

3 Raise pedestrian crossings to slow traffic speeds and prioritize pedestrians. *See 6.6.7: Traffic Calming Strategies.*

Add landscaping on the side median and along the waterfront or park to improve the pedestrian experience.

Install street furniture, lighting, and other amenities such as water fountains and children's play areas.

Provide services and dedicated spaces for vendors, food stalls, and other establishments along the water's edge.

Appendices

Appendix A

Star Rating Summary

Notes

- A single set of Star Ratings is presented (i.e. one per road user group). Where there are multiple carriageways on a single road, Star Ratings for pedestrians and bicyclists are based on side carriageways and Star Ratings for vehicle occupants and motorcyclists are based on central carriageways. Non-applicable Star Ratings are shown with the marking "-".
- Street typologies followed by a "*" have been slightly altered in speed limit or turn lane markings from GSDG guidance to accomodate updated expertise on maximum safety conditions for all road users.

Star Rating	Existing				Redesign			
	Vehicle	Motorcyclist	Pedestrian	Bicyclist	Vehicle	Motorcyclist	Pedestrian	Bicyclist
Road name								
Pedestrian-Only Streets | 18m street only	4	4	4	4	-	-	5	5
Pedestrian-Only Streets | 18m intersection	3	3	3	4	-	-	5	5
Pedestrian-Only Streets | 22m street only	5	4	4	5	-	-	5	5
Pedestrian-Only Streets | 22m intersection	3	3	4	4	-	-	5	5
Laneway | 8m street only	5	5	5	5	-	-	5	5
Laneway | 10m street only	5	5	5	5	5	5	5	5
Parklet	4	3	4	4	5	5	5	5
Pedestrian Plaza	3	3	4	3	-	-	5	5
Commercial Shared Streets | 12m street only	4	4	4	5	5	5	5	5
Commercial Shared Streets | 12m intersection	3	3	4	4	5	5	5	5
Commercial Shared Streets | 14m street only	4	4	4	4	5	5	5	5
Commercial Shared Streets | 14m intersection	3	3	3	4	5	5	5	5
Residential Shared Streets | 9m street only	4	4	4	4	5	5	5	5
Residential Shared Streets | 9m intersection	3	3	4	4	5	5	5	5
Residential Shared Streets | 10m street only	3	3	3	3	5	5	5	5
Residential Shared Streets | 10m intersection	2	2	3	3	5	5	5	5
Residential Streets | 13m street only	5	5	5	5	5	5	5	5
Residential Streets | 13m intersection	4	4	5	5	5	5	5	5

Star Rating	Existing				Redesign			
	Vehicle	Motorcyclist	Pedestrian	Bicyclist	Vehicle	Motorcyclist	Pedestrian	Bicyclist
Road name								
Residential Streets | 16m street only	4	4	3	4	5	5	5	5
Residential Streets | 16m intersection	3	3	3	4	5	5	5	5
Residential Streets | 24m street only	3	3	3	3	5	5	5	5
Residential Streets | 24m intersection*	1	1	2	2	5	5	5	5
Neighborhood Main Streets | 18m street only	4	4	3	4	5	5	5	5
Neighborhood Main Streets | 18m intersection	2	1	2	2	5	5	5	5
Neighborhood Main Streets | 22m street only	3	3	3	4	5	5	5	5
Neighborhood Main Streets | 22m intersection*	2	2	3	3	5	5	5	5
Neighborhood Main Streets | 30m street only	2	2	1	2	5	5	5	5
Neighborhood Main Streets | 30m intersection*	1	1	1	1	5	5	5	5
Central One-way Streets | 18m street only	4	4	4	4	5	5	5	5
Central One-way Streets | 18m intersection	2	2	3	3	5	5	5	5
Central One-way Streets | 25m street only	4	4	3	3	5	5	5	5
Central One-way Streets | 25m intersection	1	1	1	1	5	5	5	5
Central One-way Streets | 31m street only	4	4	3	4	5	5	5	5
Central One-way Streets | 31m intersection	3	2	3	3	5	5	5	5
Central Two-way Streets | 20m street only	4	4	4	4	5	5	5	5
Central Two-way Streets | 20m intersection	2	2	3	3	5	5	5	5
Central Two-way Streets | 30m street only	3	2	2	2	5	5	5	5
Central Two-way Streets | 30m intersection	1	1	2	1	4	4	5	5
Central Two-way Streets | 40m street only	3	3	1	3	5	5	5	5
Central Two-way Streets | 40m intersection	1	1	2	2	4	4	5	5
Transit Streets | 16m street only	3	3	4	3	-	-	5	5
Transit Streets | 32m street only	3	3	3	3	-	-	5	5
Transit Streets | 35m street only	4	3	4	4	-	-	5	5
Transit Streets | 35m intersection	2	2	4	3	-	-	5	5
Large Streets with Transit | 32m street only	3	2	1	2	5	5	5	5
Large Streets with Transit | 32m intersection	1	1	2	1	5	5	5	5
Large Streets with Transit | 38m street only	2	2	1	2	5	5	5	5
Large Streets with Transit | 38m intersection	1	1	2	1	5	5	5	5
Grand Streets | 52m street only	3	2	1	2	5	5	5	5
Grand Streets | 52m intersection*	1	1	1	1	5	5	5	5

Star Rating	Existing				Redesign			
	Vehicle	Motorcyclist	Pedestrian	Bicyclist	Vehicle	Motorcyclist	Pedestrian	Bicyclist
Road name								
Grand Streets | 62m street only (central roadway)	2	2	2	1	5	5	5	5
Grand Streets | 62m intersection (central roadway)	1	1	2	1	4	4	5	5
Grand Streets | 76m street only (central roadway)	2	2	1	1	5	5	5	5
Grand Streets | 76m intersection (central roadway)	1	1	1	1	4	4	5	5
Elevated Structure Improvement | 34m	3	3	3	3	5	5	5	5
Elevated Structure Removal | 47m (central roadway)	1	1	1	1	5	5	5	5
Street to Stream | 40m (side roadway)	1	1	3	1	5	5	5	5
Street to Stream | 40m intersection	1	1	2	1	-	-	-	-
Temporary Street Closure | 21m	1	1	1	1	-	-	5	5
Post-industrial Revitalization | 20m	3	3	3	3	5	5	5	5
Waterfront and Parkside Streets | 30m street only	2	2	1	2	5	5	5	5
Waterfront and Parkside Streets | 30m intersection	1	1	1	2	5	5	5	5

Appendix B

Coding and Assumptions

A Star Rating assessment was completed for each of the selected "before" and "after" renderings in the NACTO-GDCI *Global Street Design Guide*.

Intersections

Where it was deemed possible and appropriate, a Star Rating is provided for the street both with and without an intersection present. (The additional risk of an intersection is implicit.)

Roadways

Star Ratings are normally undertaken for individual carriageways. A large, divided road with side roads could have up to four carriageways. In this case, Star Ratings were produced for central and side carriageways. The Star Ratings presented are for those carriageways used most frequently for each road user. On multi-carriageway corridors, for example, vehicle occupant Star Ratings are based on the central carriageways, while pedestrian Star Ratings are based on the side carriageway. Please refer to the notes on each Star Rating for more information.

Transit lanes

The Star Rating model was not designed or intended for application on exclusive transit lanes. For this reason, transit lane carriageways are not provided a Star Rating.

Transit streets with light rail

To represent the additional risk of a light rail crossing, this is recorded as an intersection with a passive rail crossing. No intersection risk is recorded (i.e. vehicle or motorcycle flows intersecting with light rail).

Road attributes

These assumptions have been either based on the circumstances (such as the road type or the context of the proposed upgrade), or remained constant where there was uniformity across all of the examples. The assumptions used are listed in the table below, unless stated otherwise in the individual example.

Uniform assumptions (applied to all)

Road attribute	Assumption
Centerline rumble strips	Assumed "not present" for all
Shoulder rumble strips	Assumed "not present" for all
Curvature	Assumed "straight/gently curving" for all
Quality of curve	Assumed "not applicable" for all
Grade	Assumed 0% to <7.5% for all

Assumptions based on circumstances

Road attribute	Assumption
Lane width	Assumed based on diagram proportions (vehicle width relative to lane)
Road condition	This relates to the condition of a road surface which could result in a vehicle or motorcycle colliding with another road user. Road conditions are assumed "medium" for all "before" examples (unless otherwise stated), and "good" for all "after" examples, except where only small changes were made to the existing street (e.g. the installation of a parklet).
Skid resistance	Skid resistance is assumed to be "poor" or "medium" for "before" examples based on a combination of factors, including road surfaces typically used in urban areas and other factors such as AADT (which would likely indicate wear and tear) and performance in relation to vehicle speeds. It is assumed "poor" for all roads with over 2000 vehicles per day (VPD) and speeds of 60km/h and above. For "after" examples, skid resistance is assumed "adequate" for all, except where only minor changes were made to the existing street (e.g. the installation of a parklet).

Assumptions based on circumstances (continued)

Road attribute	Assumption
Delineation	Delineation is coded as being "poor" on all "before" examples, except where adequate delineation (clear road lines) was shown in the rendering. For all "after" examples, delineation is coded as "adequate" except where only small changes were made to the existing street, e.g. installation of a parklet.
Roadworks	Assumend "not present" for all
Sight distance	Sight distance is coded based on the characteristics of the street, such as the corridor width and likely visual obstructions (such as trees and parked vehicles).
School zone warning	Assumed "not present" for all
School zone crossing supervisor	**Assumed "not present" for all**

Speed attributes

Attribute	Assumption
Speed	Speed (both the speed limit and operating speeds) is assumed to be those specified on the examples. Any example with 30km/h or less is coded as <30km/h. Ordinarily, the higher of the speed limit and operating speed would be used to calculate the Star Rating. In this case, both speed limit and operating speeds are considered the same.
Differential speed limits	Assumed "not present" for all
Traffic Calming	If traffic calming is present, this will deliver some benefit in the Star Rating. Traffic calming is recorded where speed humps, curb buildouts, or raised crossings are present.

Note: All speeds mentioned for the existing conditions are the "operating speed," while the redesigned conditions note the target speed/design speed.

Speed table (km/h)	Existing	Redesign
Road name		
Pedestrian-only example 1: 18m	40	<30
Pedestrian-only example 2: 10m	40	<30
Laneway example 1: 8m	<30	<30
Laneway example 2: 10m	<30	<30
Parklet example	40	<30

Speed table continued (km/h)	Existing	Redesign
Road name		
Pedestrian plaza example	40	<30
Commercial shared streets example 1: 12m	40	<30
Commercial shared streets example 2: 14m	40	<30
Residential shared streets example 1: 9m	40	<30
Residential shared streets example 2: 10m	40	<30
Residential streets example 1: 13m	<30	<30
Residential streets example 2: 16m	40	<30
Residential streets example 3: 24m	60	<30
Neighborhood main streets example 1: 18m	50	<30
Neighborhood main streets example 2: 22m	50	<30
Neighborhood main streets example 3: 30m	60	<30
Central one-way streets example 1: 18m	50	<30
Central one-way streets example 2: 25m	60	<30
Central one-way streets example 3: 31m	50	<30
Central two-way streets example 1: 20m	50	<30
Central two-way streets example 2: 30m	60	40
Central two-way streets example 3: 40m	60	40
Transit streets example 1: 16m	50	<30
Transit streets example 2: 32m	50	<30
Transit streets example 3: 35m	50	<30
Large streets with transit example 1: 32m	60	<30
Large streets with transit example 2: 38m	60	<30
Grand streets example 1: 52m	70	40
Grand streets example 2: 62m (side roadway)	70	<30
Grand streets example 2: 62m (central roadway)	70	40
Grand streets example 3: 76m (side roadway)	50	<30
Grand streets example 3: 76m (central roadway)	70	40
Special elevated structure improvement example	50	<30
Special elevated structure removal example: 47m (side roadway)	70	40
Special elevated structure removal example: 47m (central roadway)	70	-
Special street to stream example: 40m (side roadway)	60	<30
Special street to stream example: 40m (central roadway)	60	-
Special temp street closure example: 21m	70	<30
Special post-industrial example: 20m	50	<30
Waterfront and parkside streets example: 30m	60	<30

Flow attributes

Flow refers to how many users are present on the street. Only two have an impact on the Star Rating risk models: Annual average daily traffic (AADT) and intersecting road volume.

Road attribute	Assumption
AADT	AADT impacts all road user Star Ratings. AADT is assumed based on the size, speed, and type of road. Note that motorcycle flow is recorded as a % of AADT and triggers the calculation of a motorcyclist Star Rating, but does not impact the Star Rating in and of itself.
Intersecting road volume	Intersecting road volume impacts intersection risk scores, and is assumed based on the size of the intersecting road.
Remaining flow attributes (e.g. pedestrian and bicycle flows and motorcycle %)	Remaining flow attributes for pedestrians and bicyclists are recorded (to trigger the calculation of a Star Rating for those road user groups), but do not impact the Star Ratings.

AADT assumptions table 1

AADT is assumed based on the size of the road (number of lanes) and speed as per the following table. Exceptions for these rules are applied to pedestrian-only streets, laneways, and shared streets. For details on these exceptions, see table 2 below.

Flow assumptions

Carriageway configuration	No. of lanes	<30 km/h	40 km/h	50 km/h	60 km/h	70 km/h
One-way (1)	1	1,000	1,500	2,000	2,500	3,000
One-way (2); Centerline (1); Physical median/ barrier (1)	2	2,000	3,000	4,000	5,000	6,000
One-way (3); Centerline (2+1)	3	3,000	4,500	6,000	7,500	9,000
One-way (4+); Centerline (2); Physical median/ barrier (2)	4	4,000	6,000	8,000	10,000	12,000
Physical median/ barrier (2+3)	5	5,000	7,500	10,000	12,500	15,000
Centerline (3); Physical median/ barrier (3)	6	6,000	9,000	12,000	15,000	18,000
Centerline (3+4); Physical median/ barrier (3+4)	7	7,000	10,500	14,000	17,500	21,000
Centerline (4+); Physical median/ barrier (4+)	8	8,000	12,000	16,000	20,000	24,000

E Existing conditions

R Redesign

AADT assumptions table 2

Road name	E	R	Intersecting Street (Estimated range)
	Vehicle volume (AADT)		
Ped only example 1: 18m	6,000	0*	100 to 1,000
Ped only example 2: 10m	3,000	0*	100 to 1,000
Laneway example 1: 8m	1,000	50*	1,000 to 5,000
Laneway example 2: 10m	1,000	1,000	100 to 1,000
Parklet example	2,000	1,000	100 to 1,000
Pedestrian plaza example	3,000	0*	100 to 1,000
Commercial shared streets example 1:12m	1,500	500*	100 to 1,000
Commercial shared streets example 2: 14m	3,000	1,000*	100 to 1,000
Residential shared streets example 1: 9m	3,000	250*	100 to 1,000
Residential shared streets example 2: 10m	3,000	500*	100 to 1,000
Residential streets example 1: 13m	5,000	2,000	100 to 1,000
Residential streets example 2: 16m	6,000	1,000	100 to 1,000
Residential streets example 3: 24m	5,000	3,000	100 to 1,000
Neighborhood main streets example 1: 18m	4,000	2,000	1,000 to 5,000
Neighborhood main streets example 2: 22m	8,000	3,000	1,000 to 5,000
Neighborhood main streets example 3: 30m	10,000	3,000	1,000 to 5,000
Central one-way streets example 1: 18m	4,000	1,000	1,000 to 5,000
Central one-way streets example 2: 25m	5,000	2,000	1,000 to 5,000
Central one-way streets example 3: 31m	8,000	4,000	1,000 to 5,000
Central two-way streets example 1: 20m	4,000	2,000	1,000 to 5,000
Central two-way streets example 2: 30m	15,000	4,500	1,000 to 5,000
Central two-way streets example 3: 40m	15,000	6,000	1,000 to 5,000
Transit streets example 1: 16m	6,000	2,000	1 to 100
Transit streets example 2: 32m	8,000	0*	1 to 100
Transit streets example 3: 35m	10,000	250*	1,000 to 5,000
Large streets with transit example 1: 32m	15,000	2,000	1,000 to 5,000
Large streets with transit example 2: 38m	15,000	4,000	1,000 to 5,000
Grand streets example 1: 52m	24,000	6,000	1 to 100
Grand streets example 2: 62m street only (side roadway)	6,000	2,000	1,000 to 5,000

E	Existing conditions
R	Redesign

AADT assumptions table 2 (continued)

Road name	Vehicle volume (AADT)		Intersecting Street (Estimated range)
	E	R	
Grand streets example 2: 62m (central roadway)	18,000	6,000	1,000 to 5,000
Grand streets example 3: 76m (side roadway)	12,000	2,000	1,000 to 5,000
Grand streets example 3: 76m (central roadway)	18,000	6,000	1,000 to 5,000
Special elevated structure improvement example	4,000	1,000	100 to 1,000
Special elevated structure removal example: 47m (side roadway)	18,000	6,000	100 to 1,000
Special elevated structure removal example: 47m (central roadway)	12,000	N/A	100 to 1,000
Special street to stream example: 40m (side roadway)	10,000	2,000	1,000 to 5,000
Special street to stream example: 40m (central roadway)	10,000	N/A	1,000 to 5,000
Special temp street closure example: 21m	12,000	0*	1,000 to 5,000
Special post-industrial example: 20m	4,000	2,000	100 to 1,000
Waterfront and parkside streets example: 30m	20,000	4,000	100 to 1,000

Note: for examples marked with a "*", AADT has been reduced to account for how these streets would function.

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Appendix C

Technical resources from the GSDG

Summary chart of illustrated typologies

The chart below provides a summary of the types of streets presented in Chapter 10: Streets, along with their overall dimensions, basic information on space allocation among users, and the case studies explored. They are not a mandated set of dimensions, but rather examples of the various ways existing streets can be transformed.

Each street illustrates multiple examples that vary in context, overall size, geometric alignment, and in certain cases, transit type. The transformations shown are based on proven strategies and real contexts, which illustrate an integrated approach to street design.

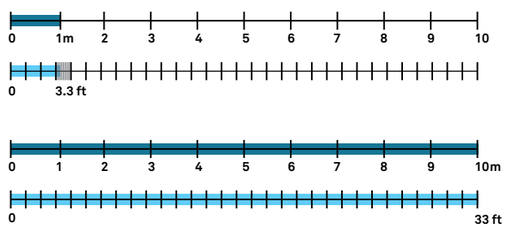
For the purpose of clear communication, streets are shown as orthogonally aligned, with the understanding that adjustments should be made to adapt to specific local conditions. Chapter 6: Designing for People will help provide alternative alignments and configurations for each typology and can clarify recommended dimensions.

E Existing conditions

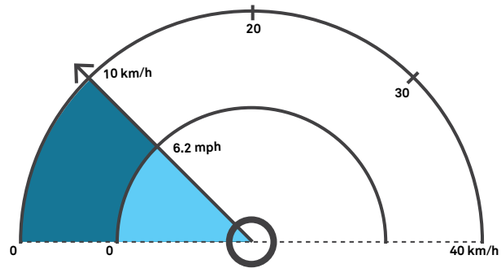
R Redesign

	Examples	Right-Sidewalk-of-Way (m)	Sidewalks (m)		Cycle Facilities		Transit Lanes		Lanes of Traffic		On-Street Parking	
			E	R	E	R	E	R	E	R	E	R
Pedestrian-Priority Spaces												
Pedestrian-Only Streets	1	18	4						2	0	•	
	2	22	6						2	0	•	
Laneways and Alleys	1	8	1.5						1	1	•	
	2	10	4.5						1	1		
Parklets	1		3	3					1	1	•	•
Pedestrian Plazas	1	32	4	6.5					4	4		
Shared Streets												
Commercial Shared Streets	1	18	4						2	0	•	
	2	22	6						2	0	•	
Residential Shared Streets	1	8	1.5						1	1	•	•
	2	10	4.5						1	1	•	•
Neighborhood Streets												
Residential Shared Streets	1	13	2.5	2.5		•			2	2	•	•
	2	18	2.5	4.5		•			2	1	•	•
	3	24	3	3.5		•			4	2	•	•
Neighborhood Main Streets	1	18	1	4.5		•			2	2	•	•
	2	22	2	4.5		•			2	2	•	•
	3	30	5	7.5		•			4	2	•	•
Grand Streets, Avenues, and Boulevards												
Central One-Way	1	18	3.5	5		•			2	1	•	•
	2	25	4	5.5		•			2	1	•	•
	3	31	6	6		•		•	4	2	•	•
Central Two-Way	1	20	2	4.5					2	2	•	•
	2	30	1.5	6		•		•	6	2	•	•
	3	40	6.5	9		•		•	6	2	•	•
Transit Malls	1	16	6	10				•	2	0	•	•
	2	32	5	8.5		•	•	•	4	0	•	•
	3	35	4	6		•		•	4	0	•	•
Large Streets with Transit	1	32	4	6.5				•	6	2	•	•
	2	38	2	6			•	•	6	2	•	•
Special Conditions												
Elevated Structure Improvements	1	34	3	5.5		•			4	2	•	
Elevated Structure Removal	1	47	3	6		•		•	10	4	•	•
Streets to Streams	1	40	6	6		•			8	2		
Temporary Closures	1											
Post-Industrial Revitalization	1	20	0	5		•			4	2	•	•
Waterfront and Parkside Streets	1	30	2.5	5.5		•			8	4		•
Historic Streets	1											

Conversion charts



Distance Conversion Chart



Speed Conversion Chart

Distance
0.1 m = 0.33 ft
0.5 m = 1.65 ft
0.6 m = 2 ft
1.0 m = 3.3 ft
1.2 m = 4 ft
1.5 m = 5 ft
1.8 m = 6 ft
2.0 m = 6.6 ft
2.5 m = 8.2 ft
3.0 m = 10 ft
3.2 m = 10.5 ft
3.3 m = 10.85 ft
3.5 m = 11.48 ft
3.6 m = 11.8 ft
4.0 m = 13.12 ft
4.5 m = 14.75 ft
5.0 m = 16.4 ft
6.0 m = 19.5 ft
10 m = 33 ft
20 m = 65.6 ft
30 m = 98.4 ft
40 m = 132.21 ft
50 m = 164 ft
60 m = 196.85 ft
70 m = 228.65 ft
80 m = 262.5 ft
90 m = 295. 3 ft
100 m = 330 ft

Speed
1 km/h = 0.62 mph
5 km/h = 3.1 mph
10 km/h = 6.2 mph
15 km/h = 9.3 mph
20 km/h = 12.4 mph
30 km/h = 18.6 mph
40 km/h = 24.8 mph
45 km/h = 27.9 mph
50 km/h = 31 mph
60 km/h = 37.2 mph

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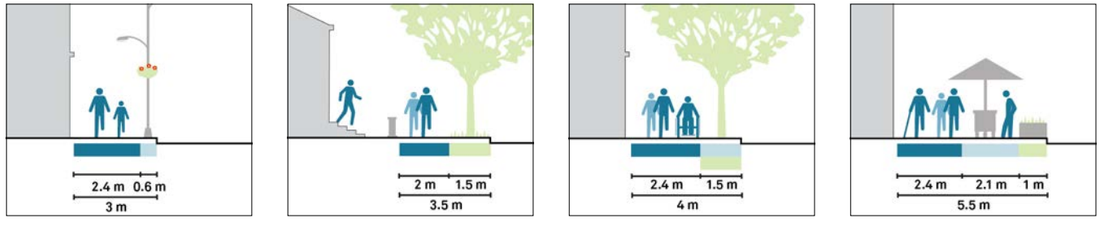
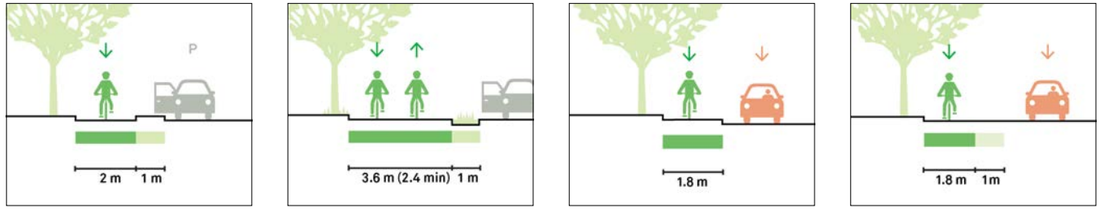
User section geometries

The Designing for People chapter explores various street users, their networks, scale, geometries, and supporting elements. A summary of the basic street geometry sections has been compiled below for reference.

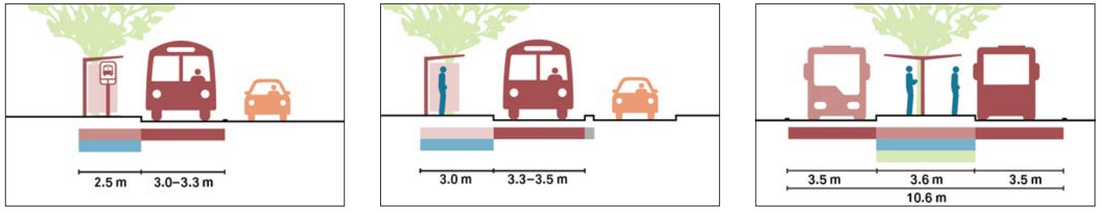
Pedestrians



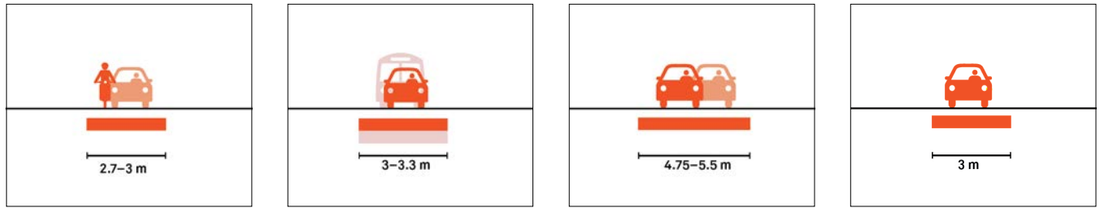
Cyclists



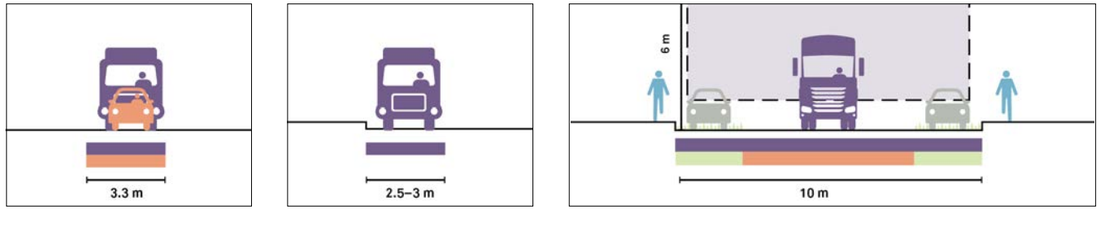
Transit Riders



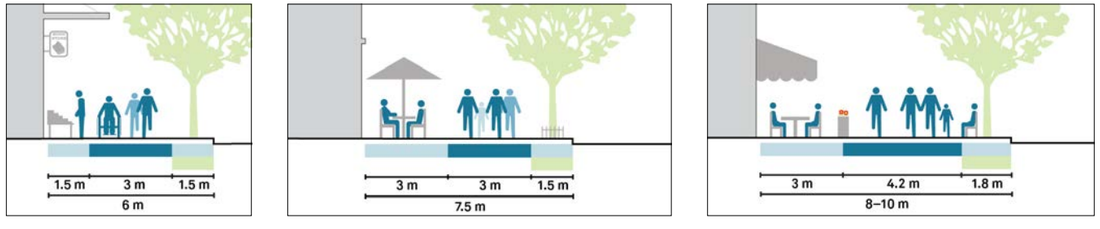
Motorists



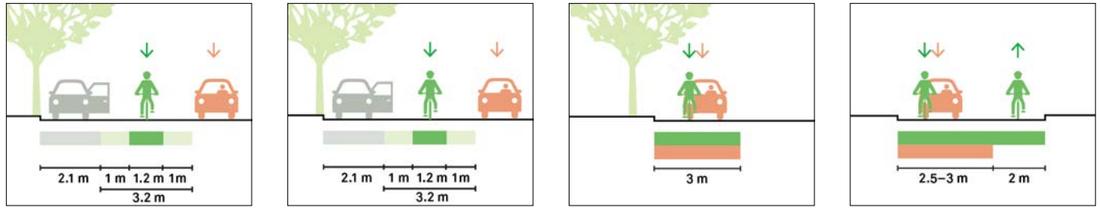
Freight and Service Operators



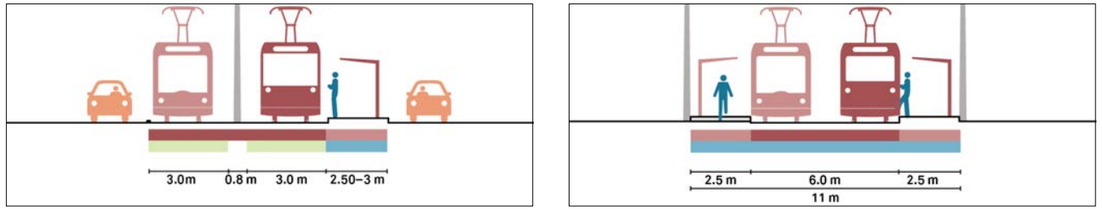
Pedestrians



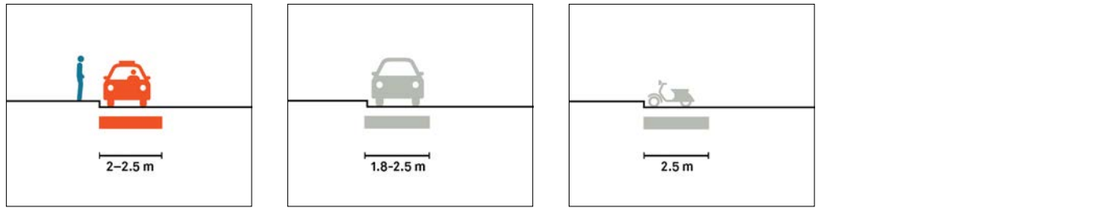
Cyclists



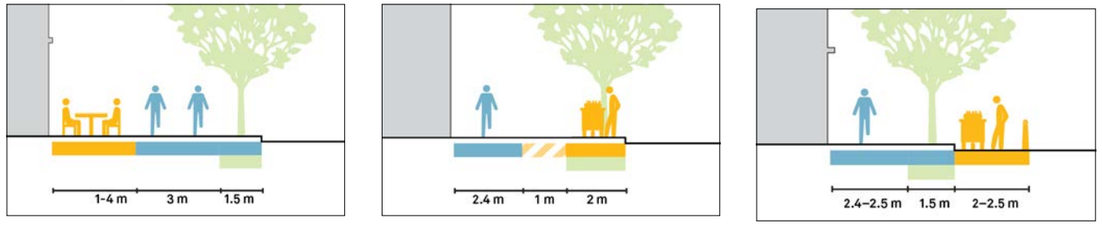
Transit Riders



Motorists



People Doing Business



Assumptions on intersection dimensions

The streets illustrated in this guide show a range of conditions. Due to limited space, dimensions have not been annotated. The following diagrams represent some of the assumed dimension ranges in the illustrations. Basic widths, spacing, slopes, and turning radii correspond to the Designing for People, Streets, and Intersections chapters.

Corner Radii

Minimize corner radii to slow turning vehicles, keep intersections compact, and ensure safe, pedestrian-friendly spaces. Corner radii in urban areas can be as small as **0.6 m**. *See 8: Operational and Management Strategies.*

Green Infrastructure

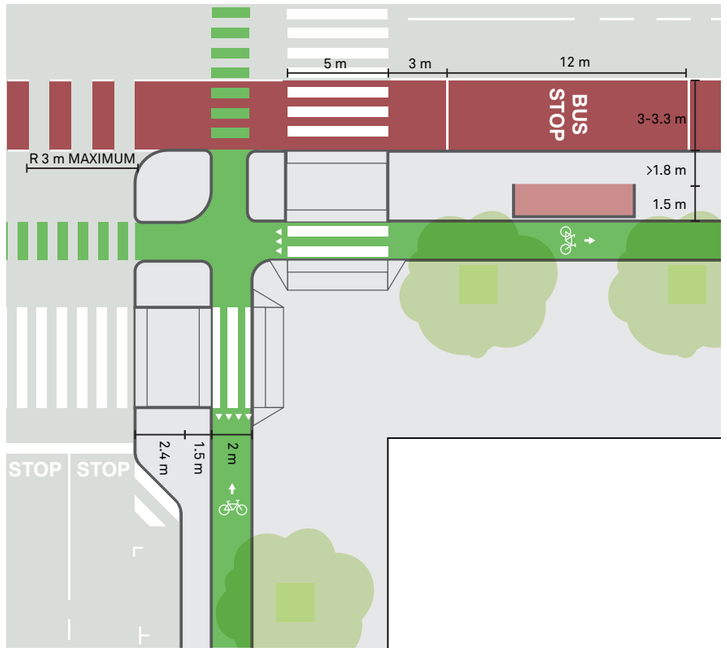
Include green infrastructure strategies in the furniture zone of the sidewalk, in curb extensions, or in medians. *See 7.2: Green Infrastructure.*

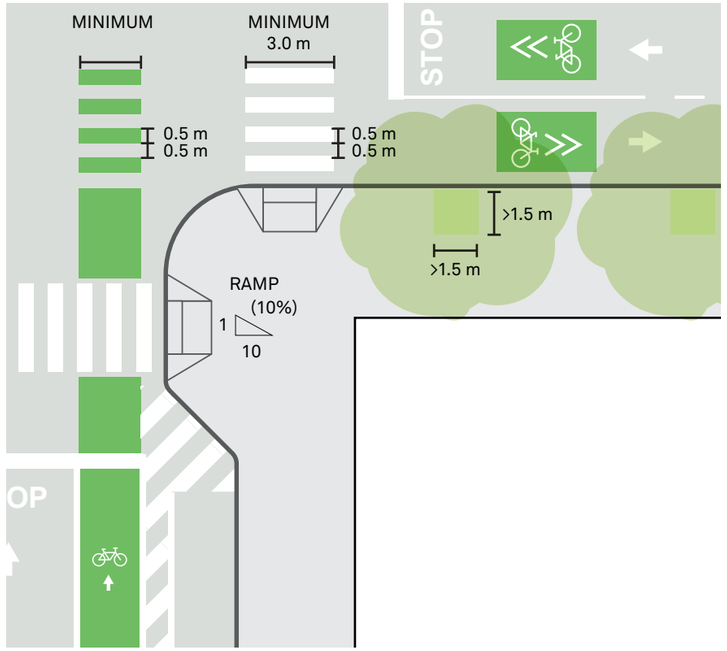
Accessibility Ramps

Design accessibility ramps at each crossing. These should be placed at 90 degrees to the path of movement and should not exceed a slope of **1:10**. *See 6.3.8: Universal Accessibility.*

Curb Extensions

Add where possible to shorten crossing distances, improve visibility, and provide additional waiting space for pedestrians, space for transit shelters, vendors, or green infrastructure. *See 6: Designing for People.*





Transit Stops and Shelters

Ensure accessible walking paths are maintained on sidewalks. The space between the structure and the curb edge should allow for accessible transit boarding. Space shelters **3 m** from intersections. *See 6.5: Designing for Transit Riders.*

Cycle-Protected Intersection

Provide physical separation for cyclists at intersections where possible. Continue markings through intersection to alert drivers and cyclists of potential conflict zone. *See 6.4: Designing for Cyclists.*

Cycle Boxes

When cycle-protected intersections cannot be included, use advanced stop cycle boxes to allow cyclists a safe and visible way to move ahead of queuing traffic when stopped at a red light. *See 6.4: Designing for Cyclists.*

Sidewalks

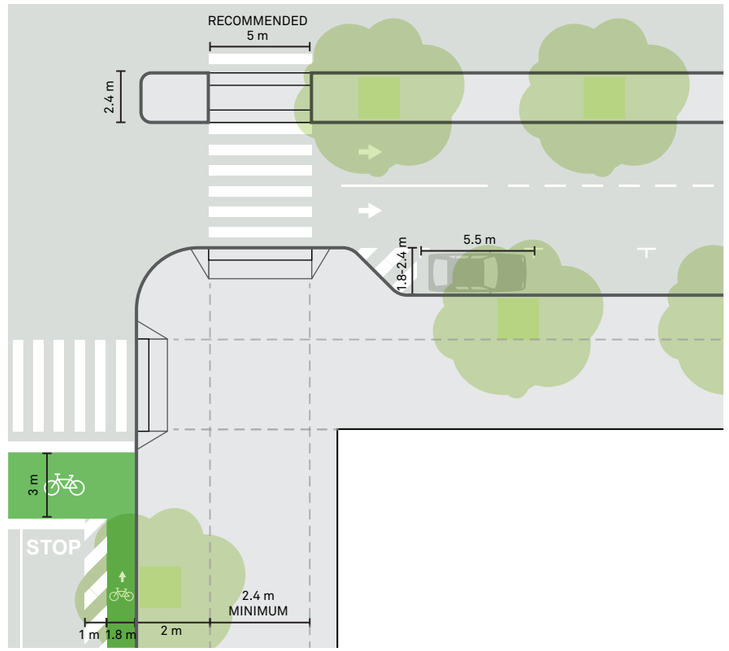
Ensure sidewalks maintain a continuous and unobstructed clear path of **2.4 m** (absolute minimum 1.8 m) to allow two wheelchairs to comfortably pass each other. *See 6.3.4: Sidewalks.*

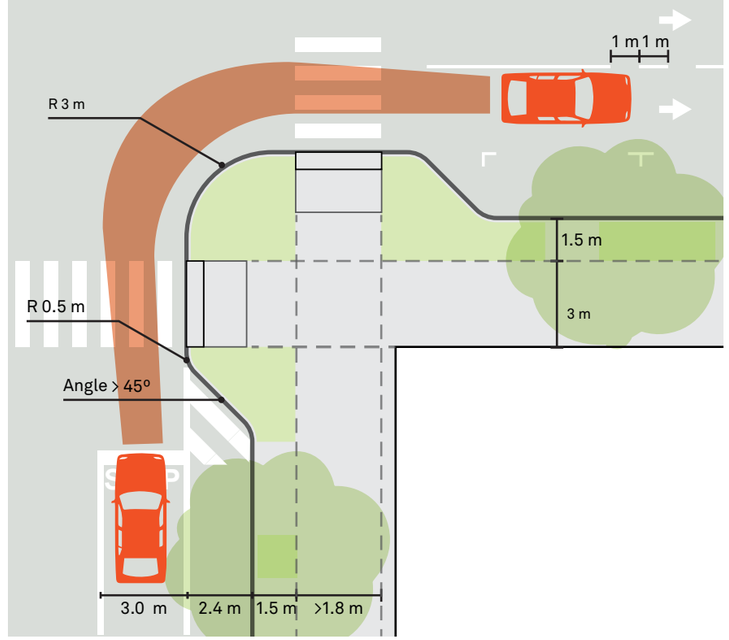
Pedestrian Crossings

Ensure pedestrian crossings align with the pedestrian clear path and are clearly marked to indicate safe places to cross. *See 6.3: Designing for Pedestrians.*

Pedestrian Refuge Islands

Provide spaces for pedestrians to wait when crossing more then two or three lanes of moving traffic. These places should be the same width as the marked crossings and be **2.4 m** deep to safely allow people to wait. *See 6: Designing for People.*



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