Transportation Infrastructure Capacity Guidelines
Metrics For Designing Infrastructure
About Slow Streets

Slow Streets is a Vancouver based Urban Design and Planning group providing original evidence for people oriented streets. We believe streets serve many uses beyond moving automobiles quickly.

The Slow Street yields the best possible return on investment.

“Streets and sidewalks are a significant part of the public realm.”
(City of Vancouver, 2012, pg. 23)

Slow Streets is an approach that challenges what streets are for, and who they are for. A typical North American city street has been designed to move the maximum number of automobiles through as quickly as possible. Since streets are a public asset, does fast moving traffic bring the best return on our investment? Slow Streets demonstrates through research that designing streets strictly for automobile right-of-ways is ultimately harmful to cities. Therefore at Slow Streets we are calling for slower, more inclusive streets that generate more value and a greater return on our investment.

Slow Streets flips the typical transportation hierarchy and prioritizes what are traditionally ‘slower modes’ over ‘faster modes’. Slow Streets argues that prioritizing slower modes like walking, cycling, and transit will yield a greater return on investment for taxpayers and municipalities. Slowing down our streets also redefines their purpose, creating the potential for new uses other than mobility. Ultimately, streets are multipurpose spaces for people and a platform for creating social and economic value.

A street is more than simply about moving automobiles. Reconsidering the use of streets can achieve significant and positive impacts for cities. We believe these benefits are measurable and observable.

Authors: Darren Proulx, Samuel Baron

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Streets are the backbones of our city. They are integral to the flow of goods and services and their proper functioning can be the difference between diminishing or increasing economic success. Far from simply utilitarian uses, they form the basic foundation of our cities and are a critical portion of public space. Given that urban space is becoming an increasingly precious commodity, how do cities balance these seemingly competing interests? This guide is meant to serve as a quick reference book for decision makers, so that they can quickly determine the minimum, mode specific transportation volumes for infrastructure. This guide cites metrics from diverse references, striving to be inclusive of all modes, going beyond moving just automobiles. The goal is to support Slow Streets philosophy that streets are precious assets in our cities that must be inclusive of all people’s needs and our overall societal goals.

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2. Space Requirements by Mode
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5. Traffic Road Lane Capacity Based on Speeds
Cost of Construction

What does it cost to build one kilometer of cycling facilities? How much does it cost to build one kilometer of infrastructure for automobiles?

When considering the infrastructure needs of each mode, it is important to understand the infrastructure costs associated with implementing each mode. Obviously, more space intensive modes like automobiles carry the highest associated roadway costs. This is due to their geometry and the fact that automobiles cause more damage to roadways than biking or walking. The data on this page describes in detail, the per meter cost for building walking, cycling and driving infrastructure.

![Cost of Street Layout per Meter for One Kilometer of Roadway](image)

Lower Costs of Construction: It is less expensive to construct and maintain cycling lanes or sidewalks instead of a vehicular lane.

- Sidewalk: $167,466
- Protected Bike Lane: $213,485
- Road: $752,480

Not only is it important to consider space allocation on a cost basis, but also on a physical basis. Differing modes have different space requirements when their vehicles are not in use which in turn has an impact on our city layouts. How we choose to allocate space and who we allocate it for, has serious implications for our quality of lives and the built form of our city. As cities grow, there will be increased travel demand and cities must decide how to provide mobility and access while accommodating population growth. As, land use and mobility are inextricably connected, there are serious spatial implications with respect to each mode. The choices we make today will shape the built form of tomorrow.

“An average daily journey from home to work by car consumes 90 times more space than the same journey made by metro and 20 times more if it was made by bus or tram” (Botma & Pependrecht)
Should We Implement a Bus-Only Lane?

When is a bus-only lane warranted? According to Todd Litman of the Victoria Transport Policy Institute, a bus-only lane is warranted when ridership levels attain a certain level of ridership during peak-hours. Buses carry more people while using less space than the private automobile, so by prioritizing bus movement more people can be moved. According to Litman’s research a bus only lane is warranted at the following ridership levels:

- 800 peak hour passengers (about 20 buses) on surface streets
- 1,800 peak hour passengers (about 30 buses) on grade separated highways

Source: Litman, 2015
Bike Lanes - The Need for Separation or Calming

Should we build grade separated bike lanes? Should bikes mix with traffic? Should we employ traffic calming measures?

This figure provides various options for urban cycling, based on how the Dutch allocate cycle space. The number of bicycles and traffic volumes per day dictates whether a cycling lane is to be combined with traffic or completely separated. Travel speeds, motorized traffic intensity (passenger car equivalent (PCU)) are also factors.

Table 4.2 from the United Kingdom provides different approximations on the type of cycling facilities based on vehicles per day and vehicle travel speeds.

Source: Delphi-MRC, 2011.

Source: Department For Transport, 2012, p.13
This figure from the Danish Cycling Embassy shows cycling facilities in relation to vehicle volume and speed. At low speeds and low vehicle volumes, it is possible for vehicles and bicycles to mix. Protected cycling lanes would not make sense with low volumes of low speed vehicular traffic. However, when vehicle volumes and speeds increase, bicycles need to be removed from vehicular traffic as it poses danger to both people biking and people driving. This figure shows when these facilities should be considered.
Traffic Road Capacity Based On Speeds

Humans can only respond to external stimuli as fast as they can process and assess a situation. The less time we have to respond to external stimuli the greater the likelihood that our responses will be too slow. In this regard, the faster a vehicle is traveling, the greater amount of space required between vehicles, as more space is required to respond due to inertia. The following graph summarizes the number of vehicles that can be moved per hour at different speeds.

Moreover, other considerations include the safety and security of all road users. Faster travel environments pose a greater threat to the safety and security of all road users.

### Speed Kills

If people are hit by a car travelling with a speed of:

- **32 km/hr**: 9/10 Survive
- **48 km/hr**: 5/10 Survive
- **64 km/hr**: 1/10 Survive

Cars can’t come to a complete stop until:

- **32 km/hr**: 12 meters
- **48 km/hr**: 23 meters
- **64 km/hr**: 36 meters

References & Sources


