

**Advantages and Disadvantages
of
One-Way Streets**



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Background

As the revitalization of the Central Waterfront area moves forward, one issue that might need closer analysis is the use of one-way streets. Does it make sense to extend existing one-way streets in Center City into the Central Waterfront? Do we use a new one-way pair arterial to replace the Delaware Avenue/Columbus Boulevard Corridor? This paper provides a concise discussion of the advantages and disadvantage of one-way streets in downtowns. The analysis gives equal weight to all modes of travel and considers all potential central waterfront users.

The popularity of one-way streets can be traced back to when downtowns were seen as predominantly a place of work, and where daytime population clears out in the evening. In this context, the transportation systems' sole function was to move traffic into and out of the downtown employment center as quickly as possible. One-way streets are seen to be more efficient for this peak hour movement of traffic and many downtowns saw conversions of their major streets to one-way operations. However, as downtowns all over the country have slowly resumed their roles as residential, cultural and entertainment centers, downtown streets' function of moving commuter traffic is now being balanced with other objectives such as business retention, pedestrian convenience, and community revitalization.

Why One-Way

If conveying commuting traffic is paramount and the effectiveness of a street network is measured by the amount of delay a motorist would encounter during peak hour, one-way streets do make sense. In fact, the Transportation and Traffic Engineering Handbook reports that the conversion of two-way to one-way operations generally increases capacity of a street by about 10 to 20 percent. This is because one-way streets offer the opportunity to control signalized intersection approaches by a single signal phase, allowing for more efficient green time distribution at intersections. In terms of safety, the argument is also often made that one-way streets have fewer conflicting turning movements at their intersections, reducing the potential for a through vehicle to encounter a turning vehicle. Finally, curbside activity such as service vehicle loading and unloading can be less disruptive to the traffic flow on a one-way street, where only one travel lane is usually blocked by this activity.

Why Not One-Way

Traffic Operations

When considering a system of roadways, instead of a single intersection or a single roadway, the operational disadvantages associated with one-way streets are more apparent. A one-way street system often forces drivers to take out-of-direction routes to their destinations, causing an increase in the number of turning movements required and the number of intersections a vehicle has to go through. The direct result of this recirculation is an increase in vehicle miles traveled (VMT) and an increase in traffic volumes on a given segment or intersection within a one-way system. One-way system generally yields 120 to 160% more turning movements when compared to a two-way system,

and travel distances from a downtown entry point to destination is usually 20 to 50% greater in a one-way system when compared to a two-way system (Walker, Kulash and McHugh, 2001, Transportation Research E-Circular, Number E-C019).

Pedestrian experience

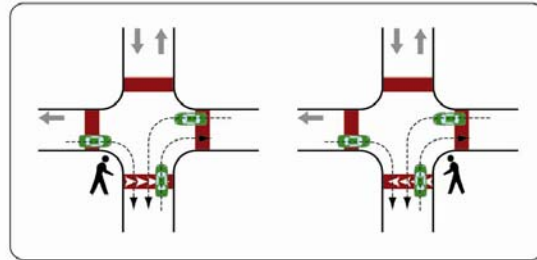
One-way streets influence the pedestrian's experience on two key things-- the comfort of pedestrians as it relates to the direction of travel of adjacent vehicles and the predictability of vehicular movement at intersections. On a two-way street, pedestrians always have the choice of walking facing the oncoming traffic. On a one-way street, pedestrians moving toward the same direction as the traffic will always have adjacent traffic coming behind them regardless of which side of the street they choose to walk on.

At intersections of two, two-way streets, pedestrians can expect the same configuration of potential vehicular conflict regardless of which leg of the intersection they are at. In intersections involving one-way streets, the potential conflict sequences vary depending on which leg of the intersection is one-way. Whereas at an intersection of two-way streets, only two potential sequences of pedestrian-vehicular conflict exist; the potential conflict sequence goes up to 16 at an intersection involving a one-way street, depending on where the pedestrian is coming from and where the one-way leg is located (Walker, Kulash & McHugh, 2001, Transportation Research E-Circular, Number E-C019). See Figure on next page.

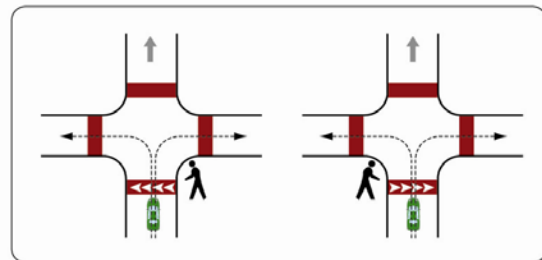
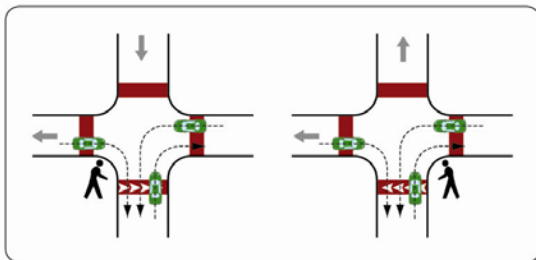
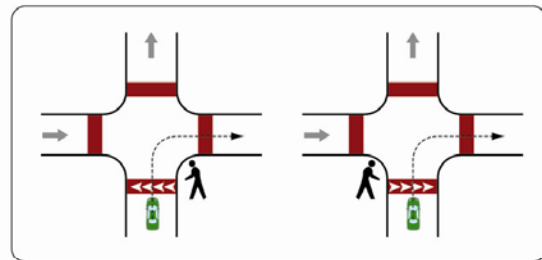
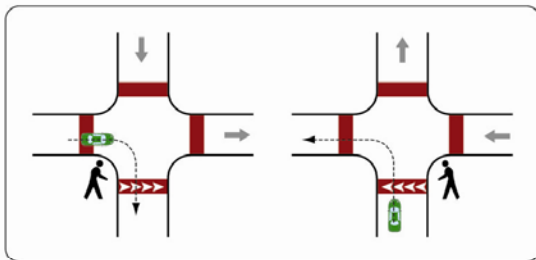
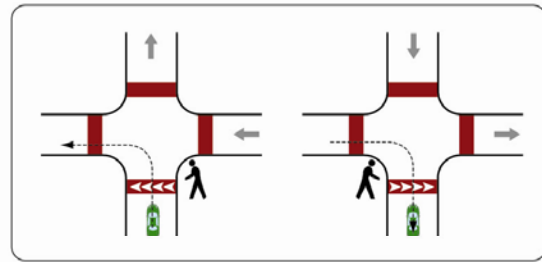
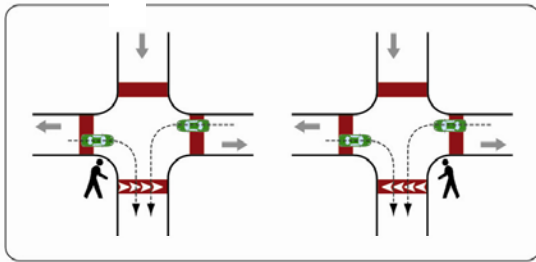
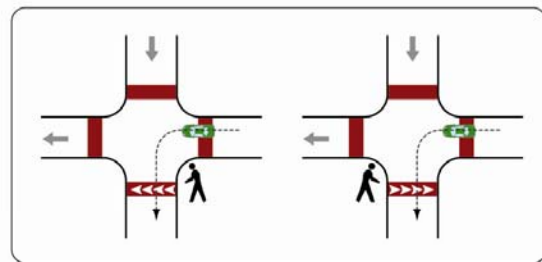
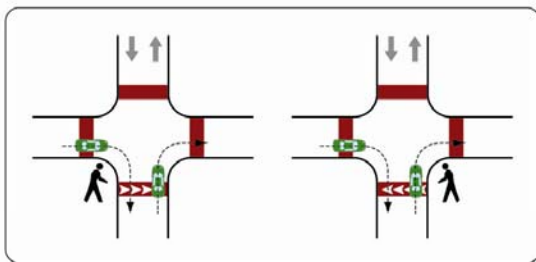
While the conflict sequences for two-way streets are closely related, and therefore easily predictable, (essentially mirror images of one another), the conflict sequences for one-way streets vary by a number of factors. One-way street conflict scenarios differ by the kind of turning movement that a vehicle is engaged in, the direction in which the vehicle path intersects with the pedestrian, and the location of the vehicle at the beginning of the vehicle movement with respect to the pedestrian's field of view. One-way streets can therefore create a situation where pedestrians cannot predict where vehicles are coming from and would entail more attention and care in crossing compared to two-way streets. The

Also, aside from the more complex pedestrian-vehicular complex sequence, one-way street systems have more potential vehicle/pedestrian conflicts. This is due to the increased number of vehicle turning movements (typically 30-40% more) that one-way street systems have inherently compared to two-way street systems.

Pedestrian/Vehicular Conflict at Two, Two-way Streets



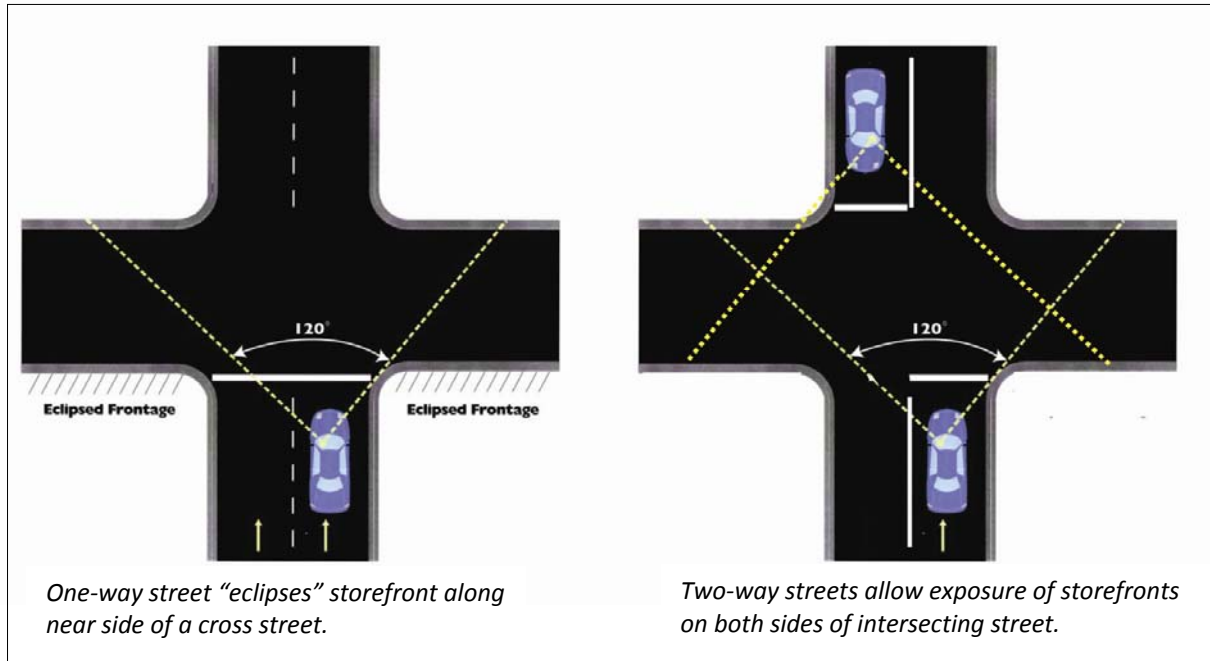
Pedestrian/Vehicular Conflict at Intersections with One-Way Streets



Potential pedestrian/vehicular conflict sequences at one-way streets

Sustaining Commercial Development

Retailers, especially those dependent on pass-by traffic, prefer a location on a two-way street than a one-way street because of the accessibility benefits that a two-way street location provides. In addition, one-way streets also affect the visibility of businesses along their cross streets. When only one direction of travel is allowed along a street, one side of every cross street is partially “eclipsed” from the motorists’ view (see Figure below). The amount of “eclipsed” storefront increases along cross streets with wider streets and as building have larger setbacks.



Supporting all Downtown Users

A successful downtown area should support activities of residents, employees, and visitors. By car, occasional visitors to downtown are often confused and disoriented as they circulate through one-way street networks. By requiring less out-of-direction travel, a two-street network is better for unfamiliar drivers and benefits all the users of downtown. Easier circulation and plenty of pass-by visibility makes downtown more conducive to visitors, an essential group of users for the Central Waterfront’s revitalization.

One-way systems also entail unfair penalty to other modes of travel. Aside from the impact to pedestrians discussed earlier, a one-way network also affects transit use. In a one-way network, transit stops on the same route for opposite directions are forced to be located on two different streets. As with vehicular travel, this issue adds a level of complexity when transit users are not familiar and regular downtown patrons. A two-way street system will allow stops for the opposite directions of one route to be located across the street from each other, eliminating a potentially confusing scenario.

Summary

The following table summarizes the advantages and disadvantages of one-way streets when compared to two-way streets.

	One-Way
Motorists	
Mobility	Out-of-Direction
Vehicle Miles Traveled	More
Turns	160% more
Through travel time (commute trips)	Minutes better
Capacity	2 to 5% better
Pedestrians	
Potential conflict sequences	14 more
Potential conflict quantity	160% more
Transit Routing	More complex
Commercial Development	
Access	Less direct
Retail Visibility	Eclipsed storefronts along cross streets