Accommodating Bike Lanes in Constrained Rights-of-Way

Members of the Association of Pedestrian & Bicycle Professionals (APBP) were asked whether 10-foot travel lanes are used in their communities in order to accommodate bike lanes on urban collector and arterial streets. This is a summary of the responses received to date. The contact listed below each summary is the person who sent the response, not necessarily the contact for that project or city.

QUESTION:
Are 10' travel lanes permitted on collectors, on arterials?
If yes, under what conditions?
Is there a traffic volume, heavy vehicle volume or speed threshold?
If 10' lanes are used, is it typically due to right-of-way constraints or because 10' lanes were considered more desirable?
Are there projects in your area where existing 11 to 12 foot lanes were reduced to 10'?
If yes, were there any impacts (increase or decrease in collisions, changes in speed or capacity, etc)?

RESPONSES:

Arlington, VA

- have been installing bike lanes on streets when they are repaved
- have a number of streets with 10' lanes & bike lanes
- have 10' lanes on arterial streets (no thresholds when determining to allow 10' lanes)
- 10' lanes & bike lanes function fine and have not had operational issues or complaints
- Charles Denney, AICP, Bicycle & Pedestrian Program Manager
  Arlington County Department of Environmental Services, Division of Transportation
  2100 Clarendon Blvd., Suite 900, Arlington, VA 2220, cdenney@arlingtonva.us, 703-228-3633

Cincinnati, OH

- 10' lanes are permitted on collectors/arterials 'all the time'
- new installations are generally where space is tight – historical areas, CBD
- some heavy truck/bus areas that they avoid 10' lanes
- all new installations are 35 mph and under
- projects where lanes were restriped to 10': restriped five segments to get bikeways – consultant recommended as low as 9', state DOT refused but allowed 10' lanes (no significant problems)
- Jim Coppock, City of Cincinnati, Department of Transportation and Engineering,Transportation Design Section
  801 Plum St, Room 435 City Hall, Cincinnati, OH 45202-1969, Jim.Coppock@cincinnati-oh.gov 513-352-5305

Colorado Springs, CO

- Have restriped five 12' lanes to: 1) five 10' lanes plus bike lanes or 2) three 10' lanes w/ wide outside travel lanes
- Wide curb lane configuration preferred on designated truck route or with poor access management
- Currently converting a 60' wide street to four 10' lanes w/ a 9' TWLTL and 5', and 6' bike lanes, ADT 18,000 (future 25,000), good access mgmt, non-truck route, posted speed 40 mph
- Kristin Bennett, AICP, Bicycle, Pedestrian and Neighborhood Traffic Programs Manager,City of Colorado Springs, Kristin.bennett@adelphia.net

Charlotte, NC

- Draft Urban Street Design Guidelines specifies 10' lanes under "constrained conditions" on some urban arterials/thoroughfares
- The city does have many 10' (and even 9' lanes) on urban arterials
- John Cook, AICP, The Lawrence Group, Town Planners & Architects, 108 S. Main St., Suite B. P.O. Box 1836, Davidson, NC 28036, jc@thelawrencegroup.com, 704-896-1696

Eugene, OR

- Collector street w/ 6,000-8,000 ADT, w/ busses & bike lanes, 36' wide, parking on one side, 9-10' travel lanes. Speed is 30 m.p.h. (residential)
- 14,000 vehicles per day, speed is 20 m.p.h. 5' bike lane, 7' parking lane, 3 10' travel lanes (one way)
- Minor arterial w/ 13,000 vehicles per day – 9 ¾' travel lanes
- Arterial and Collector Street Plan – http://www.eugeneor.gov/portal/server.pt/gateway/PTARGS_0_2_13315_0_0_18/41-76.pdf
- Rob Innerfeld, AICP, Senior Transportation Planner, City of Eugene, Public Works – Engineering
  858 Pearl St., Eugene, OR 97401, Rob.inerfeld@ci.eugene.or.us, 541-682-5343

Houston, TX (Houston Bikeways Program – 1996)

- Re-striped four lane blvd's. From two 12' wide travel lanes in each direction to two 10' travel lanes plus 4' wide bike lanes in each direction
- Some 30 miles of the arterial streets in Houston restriped. Traffic volumes range from 15,000 to over 30,000 vpd, posted speeds of 30 to 40 m.p.h. (typically 35 m.p.h.)
- Bill Hlavacek, City Traffic Engineer, City of Houston Traffic Div., Houston, TX, William.hlavacek@cityofhouston.net, 713-837-7244

Lawrenceville, NJ

- NJ Department of Transportation considers 11' to be appropriate lane width on urban arterials, but allows 10' where needed because of right-of-way or development constraints.
- NJDOT has allowed a number of 10' lanes on lower speed roadways
- Charles Carmalt, Trans Planner, 74 Birchwood Knoll, Lawrenceville, NJ 08648, 609-538-1442,ccarmalt@comcast.net

Los Angeles, CA

- Many cities use 10' travel lanes in the LA area Santa Monica, Burbank, West Hollywood, Huntington Beach"
- Ryan Snyder Associates, LLC, 431 S. Burnside Ave. #10c, Los Angeles, CA 90036-5349, 323-571-2910, ryan@rsa.cc

Portland, OR

- 10' lanes (in conjunction w/ bike lanes and otherwise) are very common
- standards found at: http://www.portlandonline.com/transportation/index.cfm?c=36900 click on "Bicycle Master Plan", and see pgs. 94 & 95
- Jeff Smith, Jeff.Smith@pdxtrans.org

Rochester, NY

- 10' travel lanes common in upstate New York
- several heavily traveled arterials (20,000-40,000), with frequent bus traffic, and truck that were routinely traveling on 40' face-to-face roadways marked w/ four lanes
- Contact same as Colorado Springs, CO

San Jose, CA

- Recently completed San Fernando Bike Lane project
- Included sections of roadway w/ 10' travel lanes, 6' bike lanes, and 7' parallel parking
- 10' lanes occurred primarily at approaches to signalized intersections where space was limited
- Corridor has bus line, no complaints from transit agency
- Posted speed is 30 m.p.h.
- 10' is the exception, not the rule in San Jose
- John Brazil, Bike/Ped Program, City of San Jose, 200 East Santa Clara St., 8th Floor. San Jose, Ca 95113-1905
  408-975-3206 John.Brazil@sanjoseca.gov

Scottsdale, AZ

- 10' travel lanes permitted on arterials & collectors
- 10' typically occur on low volume segments, near intersections, few large trucks, lower speed facilities or if adjacent lanes can be 10.5 or 11'
- thresholds are case by case, prefer less that 40 m.p.h., typically due to ROW constraints
- several lane reduction projects – typically short distances at intersections for minor collectors, major collectors and minor arterials
  Reed Kempton, Transportation Planner, City of Scottsdale, 7447 E. Indian School Rd., Scottsdale, AZ 85251
  480-312-7630, rkempton@scottsdaleaz.gov

Somerville, MA

- City of Somerville Bicycle Committee has developed travel lane and bike lane width guidelines based on traffic speeds, land use, roadway grade (uphill or downhill), bus and truck traffic.
- Preferred and minimum widths for travel, parking lanes and bike lanes are established with increases and decreases of ½ to 1' depending on conditions above.
- Guide is available by contacting swinslow@ci.somerville.ma.us

Tucson, AZ

- Speedway Blvd.: 6-lane divided roadway w/ commercial development on both sides. Speed limit is 35 mph and the ADT is 35 to 40,000 vpd. Lanes were restriped to 10' with a 4 foot bike lane Michael Hendrix, mhendrix@kittelson.com
- Configuration above is 4/10/11/11 (half section). 5/10/10/11 may have worked better. Buses tend not to veer away from edge line. Matthew Zoll, Matt.zoll@dot.pima.gov
- Two-lane residential collector, low speed, restriped 11' lanes to 10' lanes to widen bike lane to 5'
- policy: "Standard Guidance for the Installation of a Bike Route with Striped Shoulder on an Existing City of Tucson Arterial or Collector Street"
- Allows 10' travel lane "with a posted speed limit no greater that 40 mph and travel lanes with no opposing traffic in an adjacent lane"
- Turn lane widths may be 10' and even 9' with TE approval
- 4' bike lanes, including gutter pan, allowed where cross-section limited, with consideration to speed limit, presence of gutter pan, connectivity
- Bike lane to right of Right-Turn-Lane: preferred width 5', constrained widths permits 4', very constrained widths permits 3'
- If cross-section too constrained, 14' wide curb used
- Richard E. Corbett, M.S., AICP, Regional Bicycle Program Manager, Pima Association of Governments

Transportation Department, 177 N Church Ave., Suite 405, Tucson AZ 86701-1127, 520-792-1093, rcorbett@pagnet.org

Vancouver, Canada
- 10' permitted on collectors and arterials
- minimum 10.5' – 10.8' on designated truck or bus routes
- All arterials have a 31 mph speed limit
- 10' generally used due to ROW constraints - pedestrian space & urban design elements take precedence over wider traffic lanes
- Have reduced lane widths to install bike lanes
- Haven't studied the effects of narrower lanes
- Peter Stary, Bicycle Program Coordinator, City of Vancouver Engineering Services, 453 West 12th Avenue Vancouver, BC V5Y 1V4, 604-871-6437, peter.stary@vancouver.ca

The following responses were posted to a similar question posed and summarized by Ben Gomberg in 1998. They are available on the "Bike Plan Source" webpage at www.bikeplan.com/narrow.htm

Cambridge, MA
- Preferred dimensions are 11' travel, 5-6' bike and 8' parking.
- 5' bike lanes minimum adjacent to parking
- 4' min adjacent to curb
- 7' min parking lane

Philadelphia, PA
- 44' wide streets in Philadelphia are being stripped w/ 7' parking lanes, 5' bike lanes, and 10' travel lanes
- the 10' travel lane have appeared to calm traffic somewhat
- pedestrian that is crossing the street has only 20' of moving traffic to contend w/

Portland, OR
- With 44' cross-section would stripe 10' travel, 4.5' bike lane and 7.5 parking lane
- Configuration works well on streets 25-35 mph.
- Curvy streets add .5' to each travel lane
- Streets with low parking usage reduce to 7' parking lane
- Do not consider designs "sub-standard"

San Francisco
- Provide 7-8' min for parking and 5' min bike lane next to parking
- Suggest 8' parking and 14' wide curb if constrained

Toronto, Canada
- on a 46' wide street distribution is: 6.6' parking, 5.9' bike lane, 10.5' traffic lane
- seems to work w/ minimal impact on capacity for streets with up to approx. 18,000 average daily traffic volume
- one street has 5.9' parking, 5.4' bike lane, 10' traffic lanes (four traffic lanes at this width w/ frequent bus service and 30,000 adt)

Publications

AASHTO's *Guide for Development of Bicycle Facilities* (1999)
A *Guide for Achieving Flexibility in Highway Design* (2004b)
TRB Report 330, Effective Utilization of Street Width on Urban Arterials (1990)
Draft ITE/CNU Context Sensitive Design For Urban Arterials Book – http://ite.org/bookstore/RP036.pdf

From ITE Guide Page 118:
"Street width is necessary to support desirable design elements in appropriate contexts such as on-street parking, landscaped medians and bicycle lanes. Excessively wide streets, however, create barriers for pedestrians and encourage higher vehicular speeds. Wide streets can act as barriers, reducing the level of pedestrian interchange that supports economic and community activity. Wide streets discourage crossings for transit connections. The overall width of the street affects the building height to width ratio, a vertical spatial definition that is an important visual design component of urban thoroughfares. Lane width is only one component of the overall width of the street, but is often cited as the design element that most adversely affects pedestrian crossings. In fact, many factors affect pedestrian crossing safety and exposure, including the number of lanes, presence of pedestrian refuges, curb extensions, walking speed and number of conflicting movements at intersections.

General Principles and Considerations

General principles and considerations in the selection of lane widths include:

• Base the overall width of the street and the traveled way on the accumulated width of the desired design elements (for example, parking, bicycle lanes, travel lanes and median). Prioritize design elements that constitute an ideal cross section and eliminate lower priority elements when designing in constrained rights-of-way. Reducing lane width is one means of fitting the design into the available right-of-way.
• A minimum lane width of 10 ft. may be used for travel lanes on low speed urban collector streets. A 10-ft. wide turn lane may be considered on arterial streets in constrained rights-of-way. Consider design speeds of 35 mph or less (operating speeds of 25 to 30 mph) for application of 10-ft. lanes. Check local fire codes for restrictions on lane widths.
• Where adjacent lanes are unequal in width, the outside lane should be the wider lane to accommodate large vehicles and bicyclists (only where bicycle lanes are not practical).
• While it may be advantageous to use minimum dimensions under certain circumstances, avoid combining minimum dimensions on adjacent elements to reduce street width where it could affect the safety of users. For example, avoid combining minimum width travel lanes adjacent to a minimum width parking/bicycle lane, a situation that reduces the separation between vehicles and bicyclists.
• On the lower-speed urban thoroughfares addressed in this report (35 mph or less operating speed), a range of lane widths from 10 to 12 ft. on arterials and 10 to 11 ft. on collectors is appropriate (excluding gutter pan). Lanes that are 11-ft. wide are appropriate under most circumstances addressed in this report. Arterial and collector roadways with design speeds of 30 mph (5 mph over the operating speed) are appropriate for applying the lower end of the ranges (10 ft.) (Figure 9.4). The conventional 12-ft. wide travel lane is appropriate for high speed (40 mph or higher) facilities (see Chapter 11 on Thoroughfares in Vehicle Mobility Priority Areas).
• Streets with high volumes of trucks or buses require wider travel lanes, particularly the curb lane. Modern buses can be 10.5-ft. wide from mirror to mirror and require a minimum 11-ft. wide lane on roadways with 30 to 35 mph design speeds. Wider curb lanes, between 13 to 15 ft. for short distances, should only be used to help buses negotiate bus stops and help trucks and buses negotiate right turns without encroaching into adjacent or opposing travel lanes.
• When wider curb lanes are required, consider balancing the total width of the traveled way by narrowing turn lanes or medians to maintain a reasonable pedestrian crossing width.
• Consider wider lanes along horizontal curves to accommodate vehicle off-tracking, based on a selected design vehicle. The AASHTO Green Book provides guidance on widening for vehicle off-tracking.
• Turn lanes that are 10- to 11-ft. wide are appropriate in urban areas. Use the guidance in Chapter 7 regarding the design vehicle to select an appropriate turn lane width
• Wider travel lanes only marginally increase traffic capacity. According to the *Highway Capacity Manual* (2002), an 11-ft. wide lane reduces the saturation flow rate by 3 percent when compared to a 12-ft. lane, while a 10-ft. wide lane reduces the saturation flow rate by about 7 percent. Consider other means of capacity enhancement such as access management or signal synchronization before using wider lanes.
• If a network evaluation determines that sufficient capacity exists to accommodate corridor- or area-wide traffic demands, consider reducing the number of travel lanes to accommodate the desired design elements in constrained right-of-way. On streets with very high turning movements, replacing through lanes (where turns are occurring from the inside through lane) with a turning lane can significantly improve traffic capacity.
• Consider converting two parallel streets into a pair of one-way streets (couplet) to increase capacity before widening thoroughfares. While the subject of debate and controversy, one-way couplets have appropriate applications under the right circumstances. Strive to keep the number of lanes in each direction to three or less. This measure requires a comprehensive study of the ramifications for pedestrian and bicycle safety, transit and vehicle operations, economic issues, etc.

Recommended Practice

Select lane widths between 10 and 12 ft. based on the following four key considerations:
• Design speed—lanes 10-ft. wide may be considered on collector and arterial streets with design speeds of 30 mph or less. Use the wider end of the range (11 to 12 ft.) at design speeds of 35 to 40 mph.
• Design vehicle—vehicles such as transit buses or large tractor-trailers require wider lanes, particular in combination with higher design speeds if they frequently use the thoroughfare. Consider wider lanes only if appropriate for the frequency of the design vehicle.
• Right-of-way—balance the provision of the required design elements of the thoroughfare with the available right-of-way. This balance can mean reducing the width of all elements or eliminating lower priority elements.
• Width of adjacent bicycle and parking lanes—the width of adjacent bicycle and parking lanes influences the selection of lane width. If the adjacent bicycle or parking lane is narrower than recommended in this report, first consider widening the bicycle lane. If a design vehicle or design speed justify, provide a wider travel lane to provide better separation between lanes (Figure 9.5). The recommended range of lane widths for arterials (10 to 12 ft.) and for collectors (10 to 11 ft.) is consistent with AASHTO guidelines. An 11 ft. lane is used extensively on all classifications of major urban thoroughfares. AASHTO highlights benefits of narrower travel lanes on lower-speed urban streets, including a reduction in pedestrian crossing distance, ability to provide more lanes in constrained rights-of-way and economy of construction. The recommended travel lane widths are also consistent with design guidelines in AASHTO's *Guide for Development of Bicycle Facilities* (1999) and the recommendations in *A Guide for Achieving Flexibility in Highway Design* (2004b).

Research on the relationship between lane width and traffic crashes found no statistically significant relationship between lane width and crash rate on arterial streets (TRB 1986)."