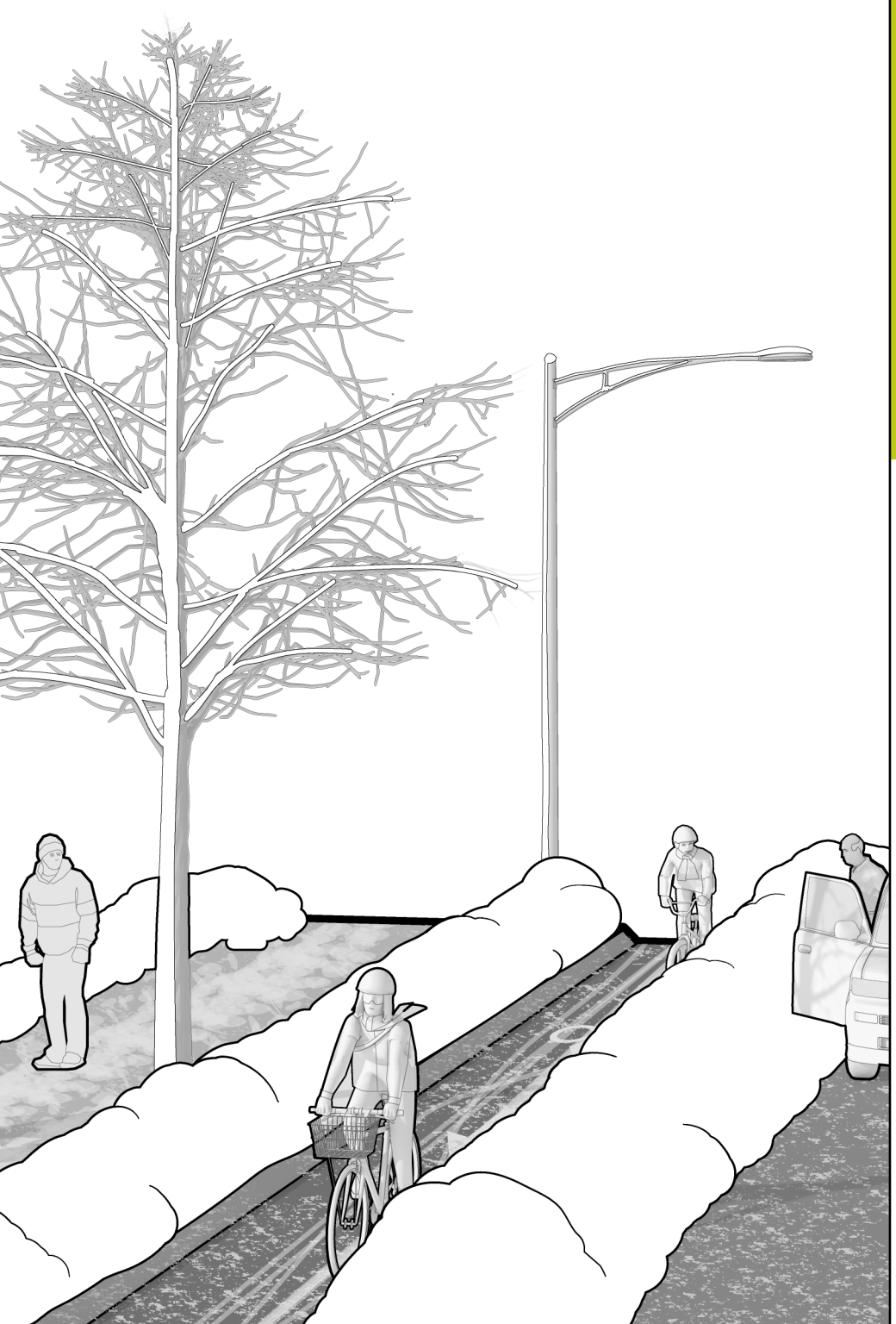


7

MAINTENANCE

Separated bike lanes require routine maintenance to ensure they provide safe bicycling conditions. Because of their location on the edge of the roadway, separated bike lanes are more likely to accumulate debris in all seasons. During the freeze/thaw cycles of the winter months, separated bike lanes are particularly susceptible to icing. As bicyclists are typically inhibited from exiting separated bike lanes, they may have no opportunity to avoid obstacles such as debris, obstructions, slippery surfaces, and pavement damage and defects.

This chapter provides best practices for the maintenance of separated bike lanes. It addresses typical elements of maintenance plans, seasonal maintenance activities, repair and replacement considerations, and strategies for construction zones.

7.1 INTRODUCTION

One challenge to maintaining separated bike lanes is the size of standard street maintenance equipment, which is often wider or less maneuverable than can be accommodated in a separated bike lane. During the planning and design process, it is therefore important to consider the widths and operating constraints of existing maintenance vehicles, as well as vehicles or equipment used by partner agencies or organizations who may be tasked with maintaining the separated bike lane. Some agencies choose to procure new vehicles for the specific purpose of maintaining separated bike lanes.

Separated bike lanes are an emerging roadway design treatment in the U.S., therefore maintenance practices are evolving. Those responsible for maintaining separated bike lanes are encouraged to periodically evaluate maintenance practices, identify creative partnerships to ensure they are maintained in a safe and usable condition, and inform designers and managers of ways to improve facilities. Personnel that perform maintenance tasks on a regular basis should be an integral part of the planning and design team.

7.2 MAINTENANCE PLANS AND AGREEMENTS

A separated bike lane should be maintained in a similar manner as the adjacent roadway, regardless of whether the separated bike lane is at street level or sidewalk level. Maintenance of separated bike lanes is therefore the responsibility of the public or private agency that is responsible for maintaining the adjacent roadway. This may contrast with responsibility for maintaining the adjacent sidewalk, which in some cases will be that of the abutting landowner.

Careful planning and agreement is important in areas where limited space for snow storage may pose a challenge for keeping both sidewalks and bike lanes free of snow. This is particularly true in retrofit situations with attached sidewalks, as those responsible for clearing the sidewalk may tend to move snow to the bike lane, and vice versa. It may be necessary to remove snow to an off-site location in these areas after large snow events.

Separated bike lane maintenance plans should address the routine removal of debris as well as long-term maintenance issues, such as repair and replacement of vertical elements, pavement surfaces, and traffic control devices. Plans should also address routine maintenance of landscaping located in the street and sidewalk buffers. While maintenance of separated bike lanes can be integrated into existing operations, these facilities occasionally require amending established maintenance practices and procedures, and purchasing specialized equipment.

Maintenance plans for separated bike lanes should be considered during the project development process. Maintenance plans should identify involved parties, outline routine maintenance procedures and frequency, assign responsibilities, estimate annual costs and identify funding sources. Often these plans will be straightforward updates to existing municipal maintenance procedures.

Responsible parties may include one or more state agencies and municipalities, as determined by right-of-way ownership, abutting land ownership, or the number of jurisdictions spanned by the separated bike lane. Public authorities may also develop partnerships with business improvement districts, school districts, universities, park agencies, institutions, developers or utility companies to help fund or take part in separated bike lane maintenance activities. Where agreements exist, maintenance plans should address transition areas so there are no sudden gaps in the quality of the bicycling environment.

In such partnerships, parties may be able to ‘trade’ maintenance responsibilities and save mobilization costs and time. For example, a school may agree to clear a bike lane simultaneously with sidewalk along their frontage in exchange for a parks department clearing a nearby path. This also serves to get facilities near critical areas (e.g., schools) open more quickly.

7.3 SEASONAL MAINTENANCE

An effective seasonal maintenance program requires the right equipment, a well-trained crew, proper execution of strategies and preventative measures, and adequate funding.

7.3.1 VEHICLES

Chief among maintenance considerations during design are routine sweeping to remove debris and plowing to clear snow. Generally, separated bike lane widths of **8 ft. or more** are compatible with smaller sweepers and plows, but responsible parties may have larger and incompatible maintenance fleets. Narrower sweepers and plows (approximately **4 ft. to 5 ft.** minimum operating width, as shown in EXHIBIT 7A) may be required to clear one-way separated bike lanes. Some vehicles can serve both as snow clearance equipment during the winter and street sweepers throughout the rest of the year. This versatility is usually accomplished with a system that allows attachment of various machines to the front of the main vehicle, such as plow blades, loaders or brooms.

The purchase of narrow sweepers and plows may be avoided by establishing maintenance agreements with partners or ensuring that vertical objects in the street buffer are removable in order to accommodate conventional vehicles that are already owned. However, the up-front expense of purchasing narrower vehicles may save money over time when factoring in additional time and labor to remove, repair or replace damaged vertical objects. Removal and reinstallation of objects in the roadway also places workers in the street more frequently and increases the risk of crashes and mobilization costs for maintenance crews.

Permeable pavements have unique maintenance needs. With respect to vehicle design, permeable pavements should be maintained with plows that are outfitted with rubber edged blades to protect the pavement. Street vacuums may also required to maintain permeable pavement.

EXHIBIT 7A: Narrow Maintenance Vehicles

Source: PeopleForBikes

Source: City of Cambridge, MA

7.3.2 SWEEPING AND DEBRIS REMOVAL

Separated bike lanes should be incorporated into established street sweeping programs. Additional sweeping of the buffer zones may be necessary to remove leaves, gravel, trash and other debris that can create slippery surfaces and increase bicyclists' stopping distance. More frequent street sweeping is usually needed in the fall and spring seasons when trees shed leaves and other organic matter at a faster rate.

For street level separated bike lanes without raised medians, debris can collect in the street buffer area between vertical objects and can migrate into the bike lane if not routinely collected. Landscaped areas, including green stormwater infrastructure, can also collect debris and require regular attention. Fine debris can settle into permeable pavement and inhibit surface infiltration unless vacuumed on a routine basis. At a minimum, permeable pavement should be vacuumed several times per year, depending on material type. Permeable pavement may need additional attention along areas where runoff routinely carries sediment, and during winter months because of sand and salt accumulation.

There are several types of permeable pavement systems that may be used. This depends on traffic loads and intensity of use, aesthetics, availability of materials, and maintenance capacity. Permeable pavements may be specified in order to meet post-construction stormwater management requirements. They are meant to be used in areas where the contributing drainage areas are stabilized and there are relatively low fine grained, or suspended solids, in the runoff that drains to the pavement. Local regulations may dictate the inspection and maintenance requirements and the maintenance cycle.

7.3.3 TRASH COLLECTION

Where separated bike lanes are introduced, the general public, public works staff and contractors should be trained to place garbage bins in the street buffer zone to avoid obstructing the bike lane. Sidewalk buffers may be used to store bins where street buffers are too narrow. Special consideration may be required in separated bike lane design for access to large dumpsters which require the use of automated arms. This may require spot restrictions of on-street parking or curb cuts to dumpster storage in order to accommodate access.

Cambridge, MA

EXHIBIT 7B: MINIMUM SEPARATED BIKE LANE CLEARANCE

7.3.4 WINTER MAINTENANCE

Ice, snow, slush and rain are commonplace during winter months in Massachusetts. Therefore, separated bike lanes should be incorporated into established winter maintenance strategies and practices.

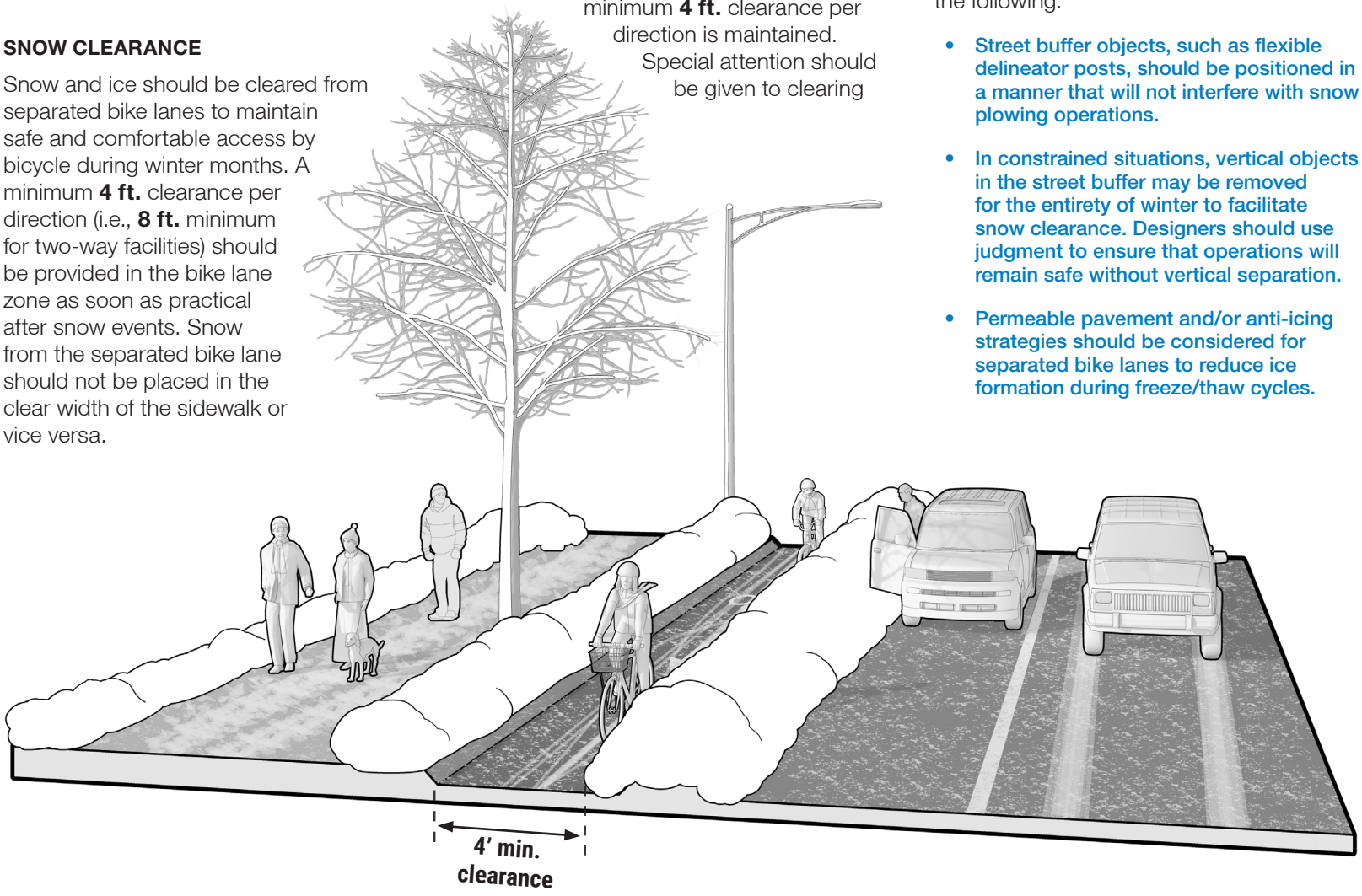
SNOW CLEARANCE

Snow and ice should be cleared from separated bike lanes to maintain safe and comfortable access by bicycle during winter months. A minimum **4 ft.** clearance per direction (i.e., **8 ft.** minimum for two-way facilities) should be provided in the bike lane zone as soon as practical after snow events. Snow from the separated bike lane should not be placed in the clear width of the sidewalk or vice versa.

Sidewalk and street buffers may be used for snow storage, as shown in **EXHIBIT 7B**, but maintenance crews should avoid piling snow at intersections in order to maintain visibility at conflict points. The width of the separated bike lane can be constrained during a snow event provided that the minimum **4 ft.** clearance per direction is maintained. Special attention should be given to clearing snow along the curb as it may block drainage infrastructure and create icy patches of pavement during freeze/thaw cycles.

Additional considerations for snow clearance in separated bike lanes include the following:

- **Street buffer objects, such as flexible delineator posts, should be positioned in a manner that will not interfere with snow plowing operations.**
- **In constrained situations, vertical objects in the street buffer may be removed for the entirety of winter to facilitate snow clearance. Designers should use judgment to ensure that operations will remain safe without vertical separation.**
- **Permeable pavement and/or anti-icing strategies should be considered for separated bike lanes to reduce ice formation during freeze/thaw cycles.**



SNOW REMOVAL

Snow removal, off-site storage, and/or snow melting may be necessary to maintain safety and access in separated bike lanes during harsh winters and major snow events when buffer zones are insufficient for storing snow. Special equipment or procedures may be needed. Consider inspecting and clearing separated bike lanes after snow events which trigger an on-street parking ban—snow removal is often easier when vehicles are not parked on the street.

ANTI-ICING AND DE-ICING STRATEGIES

Even a small patch of black ice can cause a serious crash for a bicyclist. Therefore, after a snow event when daytime temperatures rise above freezing, it is particularly important to de-ice separated bike lane surfaces.

Where possible, environmentally friendly anti-icing and de-icing strategies should be deployed for separated bike lanes. It is recommended that anti-icing materials be applied prior to snow fall and de-icers applied again while clearing snow to help prevent ice formation. Special equipment may be required for these strategies in separated bike lanes. However, standard anti-icing and de-icing vehicles may be sufficient in the event of an on-street parking ban if they can operate closer to the bike lane zone and adequately cover the separated bike lane from the adjacent travel lane or parking lane.

Maintaining proper drainage will help prevent ice formation on surfaces during freeze/thaw conditions and after plowing. Bioretention curb extension areas, tree boxes, linear water quality swales, and linear bioretention areas in the buffer zones may further aid in reducing ice formation by providing additional drainage outlets. It may be desirable to limit the use of evergreen trees or structures which may prevent the sun from melting ice and snow at locations on the bike lane where falls could be particularly hazardous to fall (e.g., near grade changes, intersections, or lateral shifts in alignment).

Consider state and local operating procedures related to anti-icing and de-icing strategies. Consult the Massachusetts Storm Water Handbook Appendix: Operating and Source Control BMPs for further considerations and best practices.

The use of sands and abrasives on permeable pavement systems will result in clogging of the surface. Separated bike lanes with permeable pavement minimize the need for de-icing methods because meltwater naturally drains through the surface instead of refreezing. Permeable pavement can reduce road salt consumption by up to **75 percent** compared to impermeable pavement,[1] but the potential effects of salt and brine infiltration on tree roots, the permeable surface, and underground utilities should be considered. Permeable concrete surfaces are sensitive to road salts which may cause the degradation of the surface.

WINTER MAINTENANCE ROUTE PRIORITIZATION

Snow events can be prolonged, heavy, and unpredictable in both duration and location. Limited budgets ensure that there will always be some delay in clearing snow from transportation facilities, whether for motorists, bicyclists, or pedestrians. Route prioritization is important to ensure that those with greatest need are served first. It is important that this route prioritization information is available to the public so that all road users know where they can expect to find clear routes when the snow does begin to fall.

Motor vehicle travel lanes normally take precedence for snow clearing in order to maintain access for emergency vehicles. Communities should consider developing a prioritization plan for clearing bicycle routes, including separated bike lanes and shared use paths. In the event the separated bike lanes are not cleared, it should be anticipated that bicyclists will be operating within the street and/or sidewalk. On high-volume streets, this may result in a degradation of safety for the bicyclist or reduced bicycling. Within a bicycle network, shared use paths and separated bike lanes may be ideal candidates for prioritization as they are likely to be routes with the highest user volumes. Other considerations for route prioritization include routes near schools, equipment

needs, width of facilities, obstacles such as separation methods, and other constraints such as time and location. Route prioritization and responsibilities for snow clearance should be clearly defined in maintenance plans when separated bike lanes span multiple jurisdictions.

7.4 REPAIR AND REPLACEMENT

7.4.1 INVENTORY AND INSPECTION

Components of separated bike lanes will need to be cared for, repaired and replaced and should be incorporated into the responsible jurisdiction's inspection program. Some jurisdictions have encouraged bicyclists to report maintenance needs and have established programs that supplement roadway inspections via call-in telephone numbers, websites or smartphone applications.

7.4.2 CONSIDERATIONS

When street maintenance is performed in a separated bike lane, for example during utility or pavement repair operations, maintenance crews should follow standard procedures supplemented with the following considerations.

SEPARATED BIKE LANE SURFACE

Longitudinal pavement seams, trenches or other surface depressions should not be left in the bike lane because they create hazards for people bicycling. Where trenching must occur, for example to access utilities, consider repaving the full width of a one-way bike lane or to the centerline of a two-way bike lane to place the resulting longitudinal seam outside of bicyclists' paths.

Gravel or other maintenance debris should be completely removed from the bike lane because these can puncture tires or lead to bicycle crashes.

STREET AND SIDEWALK BUFFERS

Repairs to curbs in the street and sidewalk buffers should follow standard repair procedures for damage or cracking.

Regular inspection for damaged or displaced vertical objects in the street buffer is recommended. Responsible parties should keep a supply of these objects for quick replacement when needed. Street buffer striping should be inspected and replaced along the same maintenance schedule and per the same retroreflectivity specifications as other roadway striping.

Trees and low-growth landscaping in the street and sidewalk buffers should be pruned to ensure proper sight distances at intersection approaches (see Chapter 4). Tree branches should be pruned to within **12 in.** from the outside the bike lane and up to **100 in.** over the bike lane surface to ensure proper vertical clearance (see Section 3.3.3).

Regular inspection for loose or damaged unit pavers in the sidewalk buffer is recommended.

PAVEMENT MARKINGS AND SIGNAL EQUIPMENT

Separated bike lane pavement markings, including lane markings and intersection markings, should be inspected as part of a routine pavement marking program and restriped as necessary.

Bicycle signals and push buttons should be maintained on the same schedule as motor vehicle traffic signals.

Maintenance crews should ensure that signal faces remain visible to bicyclists in the separated bike lane, per guidance established in Chapter 6.

Bicycle detectors, such as inductive loops or video detectors, should be maintained on the same schedule as in motor vehicle travel lanes.

7.5 CONSTRUCTION ZONES

Construction zones can create particular hazards for bicyclists because they may create width constraints, surface irregularities, surface debris, detours, or transitions between bicycle accommodations. These conditions may be in place for long periods of time or may abruptly change. Additionally, increased truck traffic and unfamiliar patterns of motor vehicle operation are of particular concern for bicyclists where operating space must be shared.

A **Temporary Traffic Control Plan (TTCP)** should provide detailed guidance to proactively address bicyclists' safety and operational needs in accordance with the **Work Zone Management** discussion in the **PD&DG**. Refer to **MassDOT Construction Standard Details** for the following examples of work zone bicycle accommodations that may be adapted to separated bike lanes:

- **Bicycle lane closures**
- **Bicycle lane detours**
- **Temporary path detours**

The TTCP should strive to meet the following objectives:

- **Educate all responsible parties of the operating characteristics of bicycles and bicyclists.**
- **Maintain separation of bicyclists from pedestrians through the construction zone at all times.**
- **Maintain separation of bicyclists from motor vehicles where feasible. Where not feasible, clearly delineate a preferred route through the construction zone. Where detours are necessary, limit out-of-direction travel for bicyclists.**
- **Avoid placing signs or equipment in the separated bike lane.**
- **Avoid requiring bicyclists to dismount.**
- **Minimize redirection of bicyclists to the opposite side of the roadway.**
- **Inspect the construction zone for compliance with the TTCP.**
- **Coordinate with advocates for feedback to improve TTCP.**
- **Minimize surface irregularities.**
- **Minimize the accumulation of debris.**
- **Provide smooth vertical and horizontal transitions that can be traversed safely by bicyclists.**

Where conditions require a deviation from a separated bike lane condition, the distance and duration of this condition should be kept to a minimum. These transitions may require temporary asphalt curb ramps. Transitions should be well signed and include pavement markings for all roadway users to minimize conflicts.

7.6 ENDNOTES

1 http://www.unh.edu/unhsc/sites/unh.edu.unhsc/files/pubs_specs_info/unhsc_houle_thesis_9_08.pdf