BASIC IMPROVEMENTS FOR BICYCLISTS

by John Williams, editor of Bicycle Forum

Here are some simple ways to improve bicycling in your community. These improvements are mostly inexpensive and require a minimum of specialized bicycle planning. They can help ease conflicts and congestion for all modes of transportation—cars, bikes, and even pedestrians.

Why encourage bicycling?

Bicycling is one of the most popular forms of recreation in America — in fact, it's number two over all. It's also excellent aerobic exercise. According to the Bicycle Federation of America, more than 80 million Americans ride bicycles. Further, the bicycle is an economical non-polluting energy-efficient means of transportation. Some communities have worked hard to support bike use and, as a result, significant percentages of their work forces commute by bike.

For example, more than 10% of the commute trips in Madison, Wisconsin, are made by bike. Other bicycling cities include Davis, California, Eugene, Oregon, Boulder Colorado, and Gainesville, Florida. By encouraging bicycle use, these cities reap benefits like improved air quality, reduced traffic congestion, and a healthier citizenry. While some of their projects have been expensive, other have not. Let's look at those mostly inexpensive—but good—ideas.

Approaches for all streets

Studies show that bicycle users can be found in all parts of a city. They share destinations and trip purposes common to other road users and use all types of streets. For this reason, add basic bicycle improvements to all streets where bikes are allowed.

Different types of users, however, prefer different types of streets. Children and casual adult riders often ride on quiet neighborhood streets or paths. Serious commuting and recreational cyclists often ride on major streets and highways.

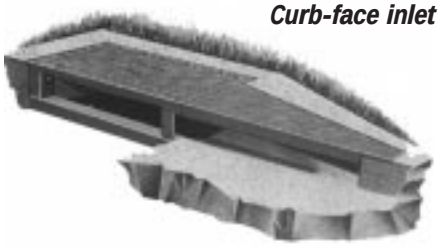
Fix or replace dangerous drain grates.

Drainage grates can be the bane of the bicyclist's existence. The worst ones are parallel-bar grates which can trap a bicyclist's wheel, causing a serious crash.

Replacing such grates with bicycle-safe models is the best approach. There are numerous designs that are both bicycle-safe and hydraulically-efficient. One good design is the curb-face inlet. These present no obstacle at all to the bicycle, as long as slopes to the inlets are not excessive.

Other safe designs include "vane" grates with short angled slots and honeycomb-style steel grates. Most grate manufacturers produce bike-safe models.

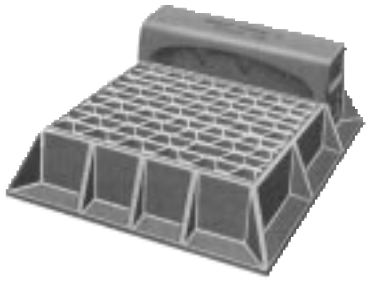
Curb-face inlet



Vane grate

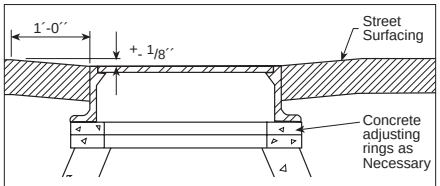
Graphics courtesy Neenah Foundry

Honeycomb design



In the short term, retrofitting may be a viable approach. Some agencies weld flat steel bars across the grate, perpendicular to the flow of traffic. This approach may work well for a while if you don't have to worry about snow plows. Other agencies usee covers of one sort or another. If not cleaned frequently, however, these can collect debris that restricts the flow of water .

Retrofitting can solve the immediate problem and reduce an agency's potential exposure to liability. However, replacing dangerous grates is the best solution and has the lowest maintenance costs. Also, don't forget to change grate standards so that future installations will use bike-safe models.



Adjusting utility cover level with road.

Graphic courtesy Montana Public Works Assn.

Installation is also important. Make sure grates and utility covers are installed level with the pavement and are adjusted flush with future pavement overlays (see above). *Reference: Bicycle-Safe Grate Inlets Study, 1977, Report #FHWA-RD 77-24; Montana Public Works Standard Specifications, MPW, 1988; Neenah Foundry Construction Castings Catalog R, 1998*

Patch and sweep carefully.

Many bicycles have relatively narrow tires and no shock absorbers. So, good surface conditions are essential. And paying particu-

Maintenance is an important concern for all bicyclists.

Careful patching can save bicyclists lots of grief.

Photo courtesy Alex Sorton

lar attention to the roadway edge and patching practices can do a lot of good.

For example, a Palo Alto, California, policy requires utility companies to patch their roadway excavations to a high standard, with no big gaps or ridges. And if a patch fails within one year, the company must fix it.

A sweeper keeping the bike lanes clean.

Sweeping is also important for bicyclists. Passing motor traffic moves debris off to the side of the roadway, where bicyclists often ride. Sweepers should pay special attention to the right edge and to places in intersections where debris builds up.

Fix railroad crossings.

There are two main railroad crossing problems. First, tracks that cross the roadway at less than 45º can divert a bicyclist's front wheel and cause a crash. Second, rough crossings can cause a bicyclist to lose control or damage a wheel.

For rough crossings, replacement with smooth concrete or rubbeized installations can eliminate the problem entirely. While these are expensive, they can significantly reduce maintenance costs. Some cities, such as Seattle, Washington, install 4-foot sections of rubberized crossing near the right edge of popular bicycling streets. This can save money while benefitting bicyclists.

One good way to solve the angle crossing problem is to flare the approaches on either side of the crossing. This allows bicyclists to cross the tracks at a right angle (see below).

Flared rubberized crossing allows bicyclist to cross safely.

On slow-speed rail lines with rubberized crossings, an alternative is to install flangeway fillers, which fill the wheel-grabbing gap next to the rail. However, this approach isn't recommended on high speed railroad lines; the filler does not compress quickly when a fast-moving train wheel hits it.
Reference: North Carolina Bicycle Facilities Planning and Design, 1994

Use current bike facility guidelines.

Since the 1960s, bicycle facility designers have learned much about how bikes perform and what riders need. Some common mistakes still exist, however, and some are being re-created today; such mistakes can lead to multi-million dollar law suits. Here are a few tips from the AASHTO (American Assn. of State Highway & Transportation Officials) 1991 *Guide:*

Don't designate sidewalk bikeways. These cause car-bike conflicts at intersections and driveways, as well as conflicts with pedestrians. Eugene, Oregon, and other cities have found that sidewalk bikeways have very high crash rates.

Two-way trail on one side of a road puts bicyclists in jeopardy.

Don't put two-way bikeways on one side of a street. These also cause serious conflicts at intersections and driveways. Two-way bike lane use has led to a number of fatal head-on collisions. And it encourages wrong-way riding.

Generous design speed on trail curves leads to safer conditions.

Use a realistic design speed on separate trails. Twenty miles per hour is a reasonable design speed on level ground. On hills, increase it to 30mph or more.

Be especially careful designing bike path curves and intersections. Unexpectedly tight curves can cause crashes, as can sight restrictions at intersections.

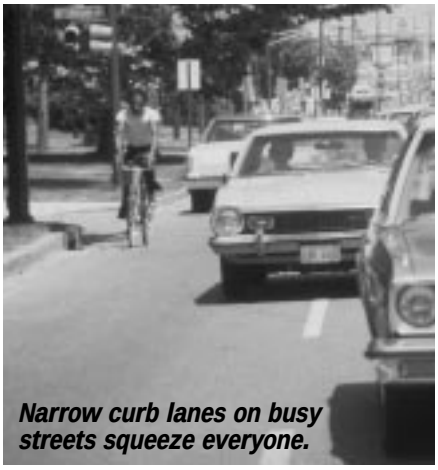
Some cities separate bikes and pedestrians on busy trails.

Shared trail use can cause problems. While it's seldom possible to avoid, mixing bikes and pedestrians on a trail can lead to serious conflicts if either bike volumes or pedestrian volumes are high. Some cities, like Calgary, Alberta, and Denver, Colorado, separate bicyclists and pedestrians onto individial trail segments in areas where use is particularly high. When shared use is unavoidable, add width and increase sight distance on curves and at intersections.
Reference: Guide for Development of Bicycle Facilities, 1991, American Assn. of State Highway & Transportation Officials

Improving Major Streets

For experienced bicyclists, cycling on major roads, while not always pleasant, has important benefits. These benefits are the same ones that motorists appreciate. Major roads tend to be more direct than quiet neighborhood streets. They are often protected by stop signs and signals at intersections. And those intersections often have good sight distance. Skilled bicyclists have little trouble riding safely on major roads.

In some cases, it is possible to add bike lanes to arterial streets. Some cities have done this by removing a traffic lane with positive results. If this is not possible, it's still feasible to improve conditions for bicyclists. Here are some important options:



Narrow curb lanes on busy streets squeeze everyone.

Create wide curb lanes.

One option for improving cycling conditions on major roads is to add width to the curb lanes. This approach gives motorists and bicyclists enough room to coexist in relative comfort.

Further, wide curb lanes can reduce conflicts between cars on the roadway and cars waiting to exit from driveways.

Wide curb lanes give more space for bikes and cars.
Photo courtesy Tom Walsh

Tom Walsh, Assistant Traffic Engineer for the City of Madison, Wisconsin, says "The wide curb lane is one of the most effective bicycle accommodation techniques available. It goes the furthest to integrate the bicycle into the normal traffic flow, allowing the bicyclist to use the existing street system as a vehicle without adversely interfering with other vehicles passing in the same lane."

How wide is wide enough? On a four-lane arterial street with 12-foot lanes, simply narrowing the inside lanes to 11 feet and widening the outside lanes to 13 feet is worth the effort, according to a study done by the Maryland DOT.

The consensus, however, seems to be that 14 to 15 feet of usable lane width (not counting curb and gutter) is the best.

References: Evaluation of Wide Curb Lanes as Shared Lane Bicycle Facilities, 1985, Maryland Department of Transportation; Highway Capacity Manual, 1985, Transportation Research Board. Road Diets: Fixing the Big Roads, Burden & Lagerwey, 1999; 1991 AASHTO Guide

Install bike-sensitive traffic signals.

Demand-actuated signals are known for being unresponsive to bicycles. Bikes generally don't have enough metal to trip the actuators. And, as a result, many bicyclists have poor attitudes regarding signals.

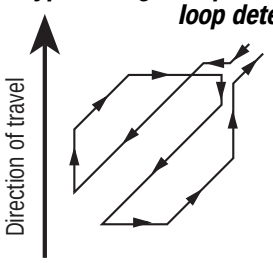
But modern detection systems can detect bicycles. The best standard design for general purpose lanes is a modified quadrupole loop (CalTrans Type D). This loop (shown below and above right) is sensitive over its entire width but the sensitivity falls off rapidly outside. This feature helps avoid detection of vehicles in adjoingin lanes. The diagonal quadrupole is an excellent design for new intersection loop installations.

Recently-installed multiple diagonal quadrupole loop detectors

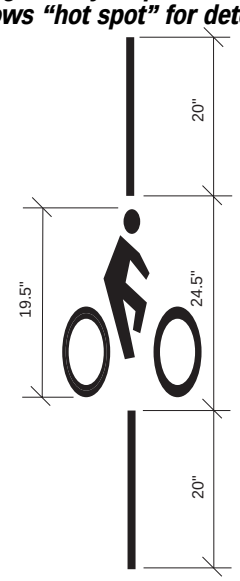
However, many signals can detect bicycles if the cyclists know where to position themselves. At intersections with standard square or rectangular loops, for example, the right edge of the loop is often sensitive enough to detect bikes and can be marked with a special pavement marking. A number of cities have experimented with various designs; the San Diego design is shown below.

References: Bicycle Forum Tech Note F-2, "Bicycles and Traffic Detectors;" Traffic Signal Bicycle Detection Study: Final Report, 1985, City of San Diego.

CalTrans Type D Diagonal quadrupole loop detector.



San Diego's bicycle pavement marking shows "hot spot" for detection.



Improving Local Streets

Many bicyclists prefer riding on quiet neighborhood streets. These bicyclists are often less skilled than those who ride on major roads. Quiet streets may be less stressful than busy streets. However, they may harbor hazards that can catch bicyclists unaware.

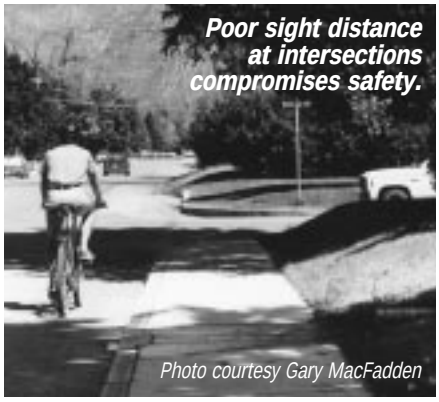
Several Federally-sponsored studies have shown that the majority of car-bike crashes happen on residential streets AND that residential streets may even have higher crash rates than do busier roadways.

The next sections discuss some of the improvements that will make local streets safer.

Here are a few local road tricks:

Improve sight distance at crossings.

Visibility at intersections is crucial to everyone's safety. This is especially true for bicyclists, since they are so much smaller and often harder to see than the typical car. Many car-bike crashes result from motorists' and bicyclists' inability to see each other due to sight obstructions like large bushes, fences, and parked cars.



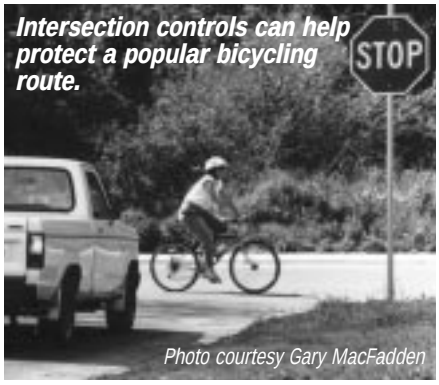
Poor sight distance at intersections compromises safety.

Photo courtesy Gary MacFadden

Keeping sight lines clear at intersections can do much to improve bicycle safety. While such improvements aren't exotic, they can be very effective.

Add effective intersection controls.

In the West, many residential street intersections are uncontrolled. Unfortunately, experience suggests that motorists (and bicyclists) often misunderstand the traffic laws governing such intersections.

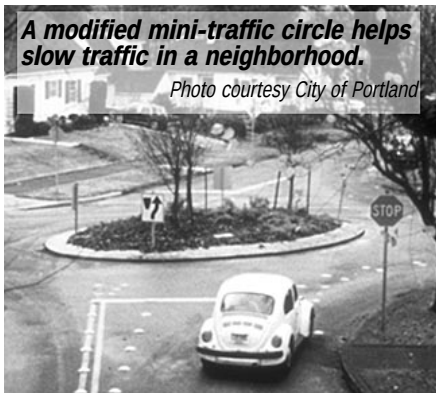


Intersection controls can help protect a popular bicycling route.

Photo courtesy Gary MacFadden

Consider installing traffic controls on low-volume streets which meet popular bicycle routes. These can be stop or yield signs, depending on local preference.

Reference: Manual on Uniform Traffic Control Devices, FHWA, 1988



A modified mini-traffic circle helps slow traffic in a neighborhood.

Photo courtesy City of Portland

Use traffic calming measures.

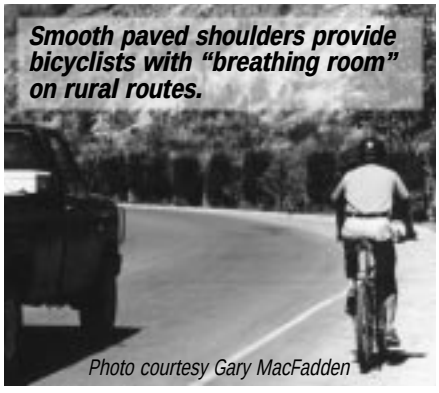
While not strictly bicycle improvements, carefully-designed traffic calming techniques can often reduce dangers of riding on local streets. By reducing either traffic speeds or traffic volumes on residential steets, such provisions as mini-traffic circles, chicanes, diverters, and speed humps can help make quiet streets even quieter.

Seattle's mini-traffic circle program is one example of a program that has been both popular with residents and has reduced the number of crashes in residential street intersections significantly.

References: Traffic Calming, CART, 1989; Traffic Circles in Residential Areas, City of Seattle, 1993; Traffic Calming in Practice, Landor Publishing, 1994

Improving Rural Roads

Rural roads offer miles of quiet and enjoyable cycling. Many bicyclists consider this type of riding to be the very best recreation available. What can be done to improve rural roadways?



Smooth paved shoulders provide bicyclists with "breathing room" on rural routes.

Photo courtesy Gary MacFadden

Pave shoulders on busy rural roads.

Some states, such as Wisconsin, add paved shoulders to rural highways when they reconstruct. They do this to encourage bicycling — they have a very active tourism program — and to improve conditions for motorists as well.

On narrow rural roads without paved shoulders, cars and trucks occasionally drop a wheel off the pavement edge. When the driver corrects, the wheels tend to tear up that edge. This damage can lead to continuing maintenance problems. Paved shoulders can cut down on maintenance costs by giving the motorists more room to correct steering errors. Further, paved shoulders can cut the incidence of run-off-the-road accidents.

How wide is wide enough? Consider paving at least three to four feet to a reasonable high standard with adequate sub-base. The Maryland Department of Transportation, for example, covers their previously-paved shoulders with a slurry seal for smoothness, They find that cyclists appreciate and use the smooth shoulders.

Reference: Guidelines for Wide Paved Shoulders on Low-Volume, Two-Lane Rural Highways; Rollins & Crane, TRB, 1989; Facilities Development Manual: "Shoulder Bikeways", WisDOT, 1993.

Use caution with rumble strips.

Rumble strips along the edge of rural highways have been shown to reduce the incidence of run-off-the-road crashes among motorists. However, unless carefully designed, they can cause serious problems for bicyclists. A rumble strip that covers the entire paved shoulder gives the bicyclist nowhere to ride except in the travel lane.

A number of states have worked hard to design rumble strips that cause fewer problems for bicyclists. For example, some state policies require the use of a narrow 12" rumble strip next to the shoulder stripe and discourage use on shoulders narrower than 6 feet.

References: Rumble Strips & Bicycle Wheels, Bicycle Forum, 1987; Survey of State Rumble Strip Policies, Adventure Cycling Assn., 1996

For more information…

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