League of American Bicyclists

SMART CYCLING

Traffic Skills 201

SMART **CYCLING**

TRAFFIC SKILLS 201

An educational program conducted exclusively by League Cycling Instructors

WELCOME TO TRAFFIC SKILLS 201.

The Smart Cycling program is designed to give you the skills you need to use a bicycle with confidence for pleasure, utility and sport. After completing this course, you'll be able to ride on any road that you choose, in a variety of conditions. Traffic Skills 201 expands on fundamental bicycle handling skills, responsible road sharing and mechanical content covered in Traffic Skills 101.

TRAFFIC SKILLS 201 OFFERS

- student diagnosis of mechanical problems
- instructor demonstration of the most frequent bicycle maintenance procedures
- rider skill in negotiating traffic
- tips and practice riding on winding roads
- bicycle handling skills and techniques for increased rider conditioning and comfort.

A goal of Traffic Skills 201 is for graduates to be able to recognize when their bicycle needs maintenance; to provide a better understanding of bicycle components, diagnosis, and maintenance; and be able to knowledgeably communicate with bicycle shop service staff.

Required Prerequisite: Traffic Skills 101 Certificate

Minimum age: 16 with parental permission; 18 without

Length of Program: 12 hours total (5 hours of classroom instruction; 7 hours of hands on instruction and practice)

LOCATION OF ROADWAY EXPERIENCES:

- Two and multi lane arterials with speeds more than 35 mph
- Multiple left turn only lanes
- Merges, diverges – passing on/off ramps
- Hills and curves on roads
- Bike lanes and freeways, when available and legal

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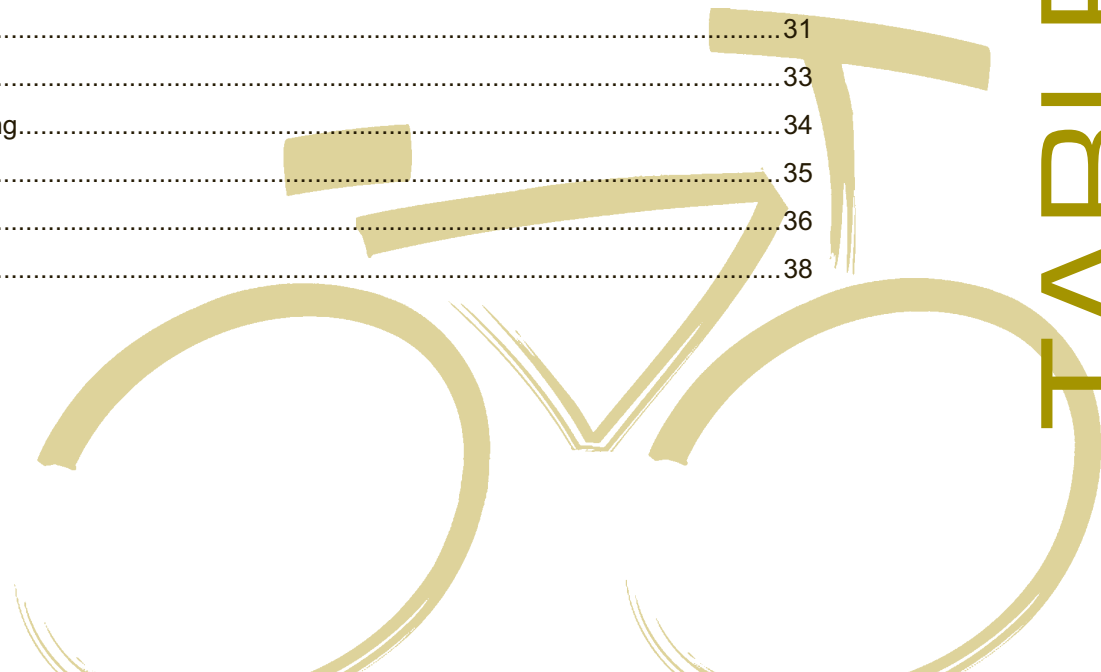


PART I
READY TO RIDE?

The Cyclist

Here is a quick review of Traffic Skills 101. If any of this is not familiar, ask now, as your instructor will assume you know this information.

Helmet Fit

Your **helmet** should be level on the head (not tilted up, back, or sideways), with the side and chin straps properly adjusted and fastened securely.

Essential Clothing & Equipment

- **Bicycling gloves** help distribute handlebar pressure across your palms, and they may protect your hands in a fall.
- **Cycling shoes** generally have a stiff sole that allows you to ride longer and stronger.
- **Sunglasses** offer protection from wind, grit, and ultraviolet light.
- You need to carry **water** if your ride is longer than one hour.
- A **bike lock** is vital if you leave your bike unattended for even short periods of time.
- Riding in the dark or in the rain requires that you be properly equipped to see and be seen. Use **front and rear lights** if you ride at night; at the very least, all state laws require a front light and rear reflector.

Basic Tools for the Road

Only carry the tools you know how to use.

- Tire levers
- Patch kit and spare tube
- Tire pump or other device to inflate tires — there are two different kinds of valves on tubes, so make sure the pump fits the ones you have.
- Allen wrenches of 4, 5 and 6 mm
- Multi-tools made specifically for bicycles have many of the tools you need for simple, on-the-road repairs.

CYCLING SHOES

Traffic Law

As a bicycle rider, in all states, you are accorded all the rights and assume all the duties of a vehicle driver. Therefore, drive your bicycle as you would any vehicle. Follow these general rules:

- First Come, First Served
- Drive on the Right-Hand Side of the Road
- Yield to Crossing Traffic
- Yield when Changing Lanes
- Slow Traffic to the Right, Fast Traffic to the Left
- At an intersection, use the right-most lane that leads to your destination.
- Most bicycle laws use the same language regarding where cyclists should drive
- Directions to ride “as far to the right as practicable” appears in most laws
- No clear definition of practicable has been identified, but it is not as far right as possible

Fueling the Engine

The bicycle is the vehicle, but you are the engine! Bicycling is a stress-free way to lifelong health. The basic principles of healthy eating will help you as a bicyclist.

Drink Before You're Thirsty!

You will perspire more heavily than normal while bicycling. Dehydration, or loss of body fluid, is a serious condition and should be avoided. Try to consume more water than normal the day before a big ride. This will super-hydrate your body in preparation for the ride. During your ride, drink the equivalent of one water bottle (20 oz.) in small amounts each hour or every 12 to 14 miles. Electrolyte (sport) drinks can greatly improve your riding enjoyment. If the weather is exceptionally hot and humid, increase the amount you drink and drink more often, alternating water and sports drinks.

Eat Before You're Hungry!

The body gets energy from carbohydrates, fats, and protein. Carbohydrates are the primary energy source for bicycling. Fats, which also serve as an energy source, are important for longer endurance rides. Proteins are used to maintain and repair muscles. The night before a long ride, eating a meal of spaghetti, salad and bread is good preparation. Figs, granola bars, and dried fruits are excellent natural sources of simple carbohydrates that will help you maintain energy during your ride. Bananas are a bicyclist's mainstay. They provide necessary carbs as well as potassium and other vitamins that your body uses in large amounts while bicycling. Plan to snack a little every 20 minutes.

Fitness Through Cycling

Bicycling strengthens your heart, helps reduce blood pressure, increases lung efficiency, and keeps your energy level up all day. Combining a sensible diet with bicycling is a terrific way to lose weight and get fit.

Let's say you weigh 180 pounds and you'd like to lose 30 pounds. If you have a sedentary job, you need only 15 calories per pound of body weight, or 2,700 calories per day (15 x 180 = 2,700), just to keep your 180 pounds. If you ride a bicycle at 10 miles per hour for one hour, you will use between 360 and 420 of your unwanted calories.

The exact number of calories burned depends on the energy you expend. For example, the table on this page shows that the faster you bicycle the more calories you use. If you drop your daily caloric intake and increase your bicycling, losing those 30 pounds can be achieved in approximately six months. Diet plus biking can be a formula for a healthy future with a stronger heart, lower blood pressure and increased energy level. You will also be able to ride farther and faster than you ever thought possible.

Calories per Hour	Miles per Hour
240-300	6
300-360	8
360-420	10
420-480	11
480-600	12
600-660	13

Warming Up


1


2


3

Just as good bicycle handling reduces the potential for crashes, a few basic warm-up and stretching exercises before you ride can dramatically reduce the potential for injury to vital muscles. Warm-ups and stretching also increase blood supply to the muscles, along with the oxygen and nutrients muscles need.

You should stretch before each ride. Muscles have intercrossed fibers. These fibers stick together when idle. You need to loosen them before you ride, so muscle fibers do not tear and cause injury.

Ease into warm-ups and stretches. Stretch slowly at first. If pain occurs when stretching, decrease intensity. Take it easy for the first 5 to 10 minutes of riding. This gives your heart time to pump blood to the muscles and for the muscles to fully warm up.

Neck and shoulders

Loosen neck muscles by rolling your head first one way then the other (photo 1). Raise your shoulders towards your ears, hold briefly then relax. This will help to loosen shoulder muscles.

Quadriceps and Lower Back

Sit on floor, assume the position shown in photo 2, lift your buttocks off the floor and twist your lower back. Hold for 10 seconds and repeat for the other side. This helps stretch the muscles on top of your thighs and in your lower back.

Hamstrings

Lower back pain often comes from tight, tensed hamstrings. Ride more comfortably by stretching to warm-up these vital muscles. Sit on the floor with your legs out straight in front of your body. Draw one leg up close to the body with the foot placed against the other leg as shown in photo 3. Stretch your arms forward as far as possible to the foot of the outstretched leg. Hold this position for 10 seconds and repeat for other leg. Do not bounce.

Calf and Achilles Tendon

Your legs are a very important part of your bicycle's engine. Warm-up the Achilles tendon and calves by stretching the back of each leg. Grab the back of a chair, a wall or a tree. Place your feet as shown in photo 4. Bend one knee, stretching the other leg. Hold for 15 seconds, then repeat for other leg.


4

Increasing Efficiency

Heart rate is one of the best measures of performance level and exertion when exercising. It is generally recommended that you sustain your target heart rate for 20 to 30 minutes of constant physical activity to increase your personal aerobic fitness level. Your target heart rate is 65 to 85 percent of your maximum heart rate. One quick way to calculate your maximum heart rate is determined by subtracting your age from 220 (226 if a woman). For example, if you are a 30-year-old male, your maximum heart rate is 220 minus 30, or 190. Your target heart rate then is approximately 140 beats per minute.

This is a quick way to measure your heart rate, but it is not as accurate as other measures, including heart rate monitors that are now a part of high-end bicycle computers. Using a heart rate monitor will give you a much better measure of your peak heart rate.

Another easy way to know if you are in your target heart rate is this rule of thumb: If you can sing, you haven't reached your target. If you can talk, and not sing, you have achieved it. If you can't talk without gasping, you're working a bit too hard.

Achieving and maintaining your target heart rate are facilitated by efficient use of the gearing on your bicycle. See the section on Bicycle Gearing for a full explanation.

First Aid

The cyclist should be prepared to take care of minor first aid emergencies. In addition to personal identification, it is good to carry the following items: disposable antiseptic wipes, several Band-Aids, and a cell phone. Leave major medical needs to the professionals. Keep at least one water bottle filled with just water, in case you need clean road rash or another kind of wound.

Using a heart rate monitor will give you a much better measure of your peak heart rate.

Training for Endurance

Going the Distance, Training for Endurance

If your goal is to increase your ability to ride comfortably farther and longer, then you will need to prepare for this. Training sounds hard, but it can be fun. The best way to train is to have a plan, work the plan and keep track of your progress. The two things you are trying to accomplish are building mileage and endurance.

Building mileage

Plan to increase your total weekly mileage by no more than 10-12 percent each week. Try to ride four to six days per week — bicycle commuting is a great way to achieve this goal. Try to get in a long ride on the weekend. Plan a combination of easy, your normal speed and brisk rides each week. Limit stops to five to 10 minutes, and for rides more than 75 miles long it is recommended that you take one five-minute stop every hour.

Building Endurance

Long distance rides are often a source of great personal pride and accomplishment. Completing these rides comfortably is achievable. Just remember to drink before you're thirsty, and eat before you're hungry. It is best to eat lightly and steadily while riding long distances. Remember to stretch before, during and after riding. Wear comfortable clothing. Padded bike shorts and a wicking bike jersey can be a good investment for longer rides. Companionship helps the miles pass quickly, so cycle with a friend. Think positively — before, during and after your ride. Have fun!

10-WEEK TRAINING PLAN FOR A CENTURY (100 MILE) RIDE

Week	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
Pace	easy	norm	brisk	rest	norm	norm	norm	
1	6	10	12	0	10	30	9	77
2	7	11	13	0	11	34	10	86
3	8	13	15	0	13	38	11	98
4	8	14	17	0	14	42	13	108
5	9	15	19	0	15	47	14	119
6	11	15	21	0	15	53	16	131
7	12	15	24	0	15	59	18	143
8	13	15	25	0	15	65	20	153
9	15	15	25	0	15	65	20	155
10	15	15	25	0	10	5	100	170

PART II
THE BICYCLE

Using All the Gears

Terrain, your weight and weather conditions will play a definite role in how easily your bicycle moves along the road. Most bikes have the option of many gears to assist in maintaining the desired 70 to 90 rpm cadence through all conditions.

Climbing hills is challenging for most cyclists but there are steps you can take to make the climb as pleasurable (ha!) as possible.

Climbing Hills

Climbing hills is challenging for most cyclists. When you see a hill coming, the first thing you should do is shift to a lower gear. If you delay shifting until it is difficult to pedal, it is hard to shift to a more favorable gear. Shift to your next to lowest front gear as you initiate the climb, reducing your force on the pedals as you do so. To maintain your cadence, adjust your rear gears as you continue to climb. When your cadence begins to drop, shift to your lowest front gear.

There is a general rule of thirds for hills. Coming into the hill, you try to maintain your cadence. When you get to your lowest gear, pedal hard as well as you can for the second third of the hill. For the last third, try to shift up two gears and stand up on the pedals. This obviously doesn't work on a really long climb, but even on long climbs you need to be getting out of the saddle occasionally, to change the muscles that you are using.

Most hills have slight level areas where you can ease the pressure on the pedals and shift quickly. If you find you waited too long to shift, try standing up for a couple of pedal strokes to gain momentum, then quickly sit down, ease the pressure on the pedals and shift. If you can't do this, stop, dismount, hold up your rear wheel, crank your pedals by hand and downshift; then remount and continue. Hill climbing becomes more natural with practice. The more you climb the more refined your shifting techniques becomes, and the more pleasurable (ha!) climbing is.

Headwinds

Shifting to a lower gear is also desirable to maintain cadence when dealing with a strong headwind. Pushing a high gear and low cadence will sap your energy and may injure your knees. Spinning at 70-90 rpm may seem strange at first but you will find at that rotation you can comfortably handle any terrain.

Descending

If you do not know the road or traffic volume, ride with extra caution. Hazards are harder to avoid at high speed, especially while turning. Do not overtake motorists unless the road allows it

Ride predictably. Remain in the same portion of the roadway down a curvy descent. Take the lane if you are traveling the same speed as motorists. Take the lane if the road is narrow and curvy regardless of speed.

Brakes

Rim Brakes

Rim brakes consist of two elongated rubber composite pads or blocks, attached to arms that fasten to the bicycle frame. These pads press against both sides of the rims when the handlebar mounted levers are squeezed. The levers are connected to their respective brake arm assemblies by a wire cable in a housing. Whether your bike has side pull, direct pull or cantilever brakes, the action required to apply the brakes, and many of the adjustments and repairs, are the same.

center pull brakes

direct or linear pull brakes

Basic Maintenance for Rim Brakes: Inspect for Wear

Begin routine maintenance of the bicycle braking system by checking the brake pads for wear. Test for wear by grabbing your levers and pulling them — if you do not have a thumb's width between the lever and the handlebars, the cable needs to be adjusted or the brake pads need to be replaced. As a rule of thumb, each brake pad should have at least 1/8" (2 mm) of rubber showing above the wear indicator line.

1. Check to make sure the rim and the brake pads are clean. The presence of wet or greasy dirt plays havoc with their operation. Wipe the rim clean and rub the brake pad with fine sandpaper.
2. Check cables for freedom of movement. Inspect cables for wear or fraying, especially where the cable enters and exits the cable housing.
3. Inspect the levers. There must be at least 2 cm (or a thumb's width) clearance between the lever and handlebars when the brake is fully applied.

4. Make sure the brake arms move freely and that they return to clear the wheel by spring tension when the lever is released.

Adjust Brake Pads

This simple job is often the solution to squealing, rumbling or vibrating noises, and may also solve inadequate braking performance and prevent serious mishaps. As the brake pad wears, its position relative to the rim changes. You should regularly check the position of the brake pads as they contact the rim, and readjust them if they don't align.

It is also preferable if the front end of each brake pad is about 1 mm

closer to the rim than the rear. This is to compensate for the bending of the brake arm as you squeeze the brake. Adjusting them this way, referred to as toe-in, makes the brake work properly. A squealing brake is a sure sign that it is not toed-in properly.

Tools and equipment needed

- 5 mm Allen wrench
- 9 or 10 mm wrench

Procedure

1. Loosen the nut or bolt that holds the brake pad holder to the brake arm.
2. While applying modest pressure to the brake lever, move the brake pads, one at a time, into position, and then increase lever force. On cantilever and direct pull brakes, you may have to twist the brake pad and the underlying cupped washers to achieve this position.
3. To get proper toe-in, wrap a thick rubber band around the back of the brake pad. Make certain to note any directional indicators on your particular brake pads as some have a front and a back.
4. Holding the brake pad against the side of the rim firmly, make sure it does not shift from its correct position, and then tighten the bolt fully. At this point, remove the rubber band.
5. Check to make sure the brake works correctly and fine-tune the adjustment if necessary.

Brake Cable Adjustment

In addition to normal cable stretching, brakes can become misaligned due to pad wear. Brakes should be fully engaged when a minimum of 2 cm (3/4") clearance remains between the brake lever and the handlebar. Making fine adjustments to brakes will allow the brake pads to move closer to the rim without loosening the cable fixing-bolt. A barrel adjuster at either end of the housing may be turned counter clockwise, moving the pads slightly closer to the rim.

Brake Cable Removal and Installation

Brake cables come in a standard length for most bikes. The most important aspect of brake cables is defined by the shape of the metal anchor piece. Mountain bike brake levers require an anchor that resembles a barrel standing upright, with the cable stuck into the side. Road bike brake levers require a different style of ball with a rounded end.

You should regularly check the position of the brake pads as they contact the rim, and readjust them if they don't align.

Replacement cables are available with a Teflon coating to decrease friction and increase cable life. Always use stainless steel or Teflon coated replacement cables, as they tend to resist corrosion and last quite a bit longer than galvanized cables.

It is also a good idea to replace cable housing when you replace your cables. Remember that brake and derailleur housings are different. The best way to tell derailleur housing from brake housing is by looking at the end. Both types gain their strength from steel under the plastic, but in derailleur cables, the metal strands run the length of the housing. In brake housing, the metal is wrapped in a spiral pattern to resist the pressure of braking.

Cables typically stretch, rust or fray from use. Compensate for stretching using the barrel adjuster. If the cable has rusted or frayed, it should be replaced. Remember to check for cracked or otherwise damaged cable housing. To test this, pull your brake and let go of the handle. If it doesn't snap back, it needs to be replaced.

Procedure

1. Begin by loosening the anchor bolt at the brake assembly, then pull the cable out through the brake lever.
2. Check the cable housing for rough surfaces by sliding the old cable back and forth through each section of housing. Replace the housing if it is cracked or there are any signs of binding.
3. Begin insertion of a new cable by coating it with a thin film of grease or chain lube. Cut the cable cleanly with a cable cutter.
4. Thread the cable through the housing starting at the brake lever. Slide the cable through the lever, housing(s) or top tube and the anchor bolt.
5. Make tension adjustments. Keeping the cable taut, tighten the anchor bolt.

6. Using cable cutters, cut the end of the cable. Leave about 2" (5 cm) of extra cable beyond the fixing bolt. Crimp a metal end cap over the cable end with pliers to prevent future fraying of the cable.

After replacing any cable, brake or derailleur, the cable may stretch slightly. This will cause the brakes to feel loose. To avoid this readjustment period, you can pre-stretch the cable during installation.

Pre stretching a cable is a good way to avoid a readjustment of your controls after an overhaul. With brakes, it's simple. After cable replacement, squeeze the lever as hard as you can, bringing the lever as close to the handlebar as possible. This brute force will stretch the cable more than normal braking ever would. Simply loosen the brake cable anchor bolt and remove the added slack.

Hub Brakes

There are three types of hub brakes: coaster, drum and disc. For this class, we are only discussing disc brakes. The levers for disc brakes will be the same as those for rim brakes, but some disc brakes have hydraulic systems instead of cables to activate them. Maintenance of a hydraulic system is difficult because of the necessity of bleeding all of the air out of the system. Unless you are very comfortable with this procedure, you might be better off taking your bike to a shop. For disc brakes that use cables, adjusting the cable tension is very similar to rim brakes.

Coaster Brakes

Disc Brakes

Disc Brake Pad Inspection and Adjustment

Disc brakes can be actuated by cables like rim brakes or by hydraulic lines like the brakes in an automobile. In a cable system adjusting the cables for brake wear is similar to adjusting cables for rim brakes. In an hydraulic system the force on the brakes is transmitted from the levers by a fluid and many have a self regulating mechanism to allow of wear of the pads. Unless you have the proper tools and working space you should take your hydraulic brakes to the shop for service.

One of the parts of a disc brake that can be serviced by the owner is the disc. If a disc gets warped by overheating or being struck in a crash it needs to be straightened before it will work. Using a large adjustable wrench to clamp carefully over the disc and slowly bend it back into shape may work for a while. The best practice is to replace the disc if it becomes warped.

Derailleurs

Replacing the derailleur cable is essentially the same procedure as brake cables. Derailleur cables also come in a universal length. Select a stainless steel or Teflon coated cable, lube it and install. Be sure to feed the cable through any guides and housing on its way to the derailleur to insure crisp shifting.

Rear Derailleur

Front Derailleur

Rear Derailleur

1. Shift the chain to the smallest cog and largest chainring combination, then remove the old cable.
2. Line up the top pulley directly under the smallest cassette cog using the 'H' set screw.
3. Thread adjuster barrel at derailleur and shifter (if applicable) clockwise until they stop.
4. Install the new derailleur cable. Remove slack from cable and tighten cable anchor bolt — it is important that you only remove slack! Don't pull it so hard that the derailleur moves.
5. Shift through all the gears. If shifting is slow to lower gears, turn barrel adjuster counter clockwise.
6. Shift into lowest gear (biggest cog). If shift is smooth, tighten 'L' set screw until there is resistance. If lowest gear cannot be reached, turn adjuster barrel counter clockwise until shift lines up. If indexing is accurate, turn 'L' screw counter clockwise to allow derailleur to reach to lowest gear.
7. Rear derailleur is properly set up if top pulley is lined up directly below a cog in the middle of the cassette.

Front Derailleur

Adjustments to the front derailleur are required when the derailleur drops the chain off the side of the chainrings (inside or outside) or when one chainring cannot be reached.

1. Check that the derailleur cage is perfectly parallel to the chainrings. Allow about 1/8" (about a penny's width) vertical clearance between the largest chainring teeth and the bottom of the cage. Disconnect the cable, loosen the clamp bolt and twist the derailleur into this position.
2. With the cable disconnected and the chain on the smallest chainring, shift the rear derailleur onto the largest cog. Using the 'L' set screw, align the derailleur so that the inside plate is 2 mm from the chain. Reattach cable to derailleur, removing slack with your hand.
3. Shift the front derailleur to check the indexing of the shifter, making small adjustments at the anchor bolt as necessary. If shifting is correct, turn 'L' set screw one half turn counter clockwise.
4. Shift chain to smallest cog and largest chainring. If chain rubs outer plate of derailleur, turn barrel adjuster counter clockwise or make adjustment at cable anchor bolt.
5. When derailleur position is correct on large chainring, turn 'H' screw

clockwise until resistance is met. If large chainring cannot be reached, check cable tension then try to turn 'H' screw counter clockwise.

Fine-tune Index Shifting

Check that the derailleur set screws, 'H' and 'L,' are adjusted correctly by following #2 and #6 above. The chain should not come off of the cassette when shifting. The 'H' screw limits the derailleur travel towards your smallest cog while the 'L' screw limits how far the derailleur can travel to the largest cog.

Once you have the travel of the derailleur correctly set using the 'H' and 'L' screws, the only problems that you should ever run into should be a function of cable stretch or derailleur damage.

After replacing any cable, brake or derailleur, the cable may stretch slightly. This will cause the shifting to become sloppy and slow. To avoid this readjustment period, you can pre-stretch the cable during installation.

Removing derailleur cable stretch is a bit more complicated. Shift the derailleurs to the position closest to the center, from left to right, of the bike. Without turning the cranks or moving the wheels, shift the shifters to release all of the cable. Grab hold of the cables and pull as hard as you can, away from the bike. This will stretch the cables harder than any shifting could. Remove slack at the anchor bolts or by using the barrel adjusters.

A finely tuned bicycle is a pleasure to ride. The bicycle is basically a simple machine. Knowing how to diagnose potential problems will help you prevent mechanical problems that may spoil your ride. If you ever have any doubts about your personal repairs or condition of your bike, please take it to your local independent bicycle dealer for service, parts and advice.

The Bicycle Chain

A clean, well-maintained bicycle chain runs smoothly, shifts quickly and can last thousands of miles. More than any other part of the bicycle, the chain is exposed to abrasives such as dirt and sand as well as water, which wash away protective lubricants. Chains wear out due to twisting in the course of shifting and from dirt contamination. Chains also wear out due to stretching from pedaling. Cassettes and chainrings wear at a slower rate than chains. Periodic chain replacement may help extend cassette and chainring life.

The bicycle chain is constructed of alternating wide and narrow side plates, or links. A hollow bushing surrounded by a roller bearing separates the inner plates. A pin runs inside the bushing connecting the two outer plates and the inner plates together. Twelve links of chain should be 12 inches long. If twelve links are 12 1/8 inches or more, replace the chain.

Bicycle chain

Chain Removal

Chain maintenance does not ensure that you will never have a problem with your chain. Knowing how to fix or replace a chain is important for cyclists to know.

Procedure

1. Chain tool holds the chain in place on pegs (in the position farthest from T handle).
2. Turn the T handle to push the tool's pin against the chain rivet, forcing it out, but do not to push the chain rivet past the outer plate on the far side. The ends of the rivet are slightly wider than the holes in the outer plates, therefore the rivet is virtually impossible to reinstall if pushed out.
3. Reverse the driver, screwing the T handle back out
4. Take the chain off the chain tool pegs; try to separate it by twisting it back and forth slightly. If you can't, put the chain back on the pegs, turn the driver another quarter turn, try again to separate it. Keep trying until the chain separates.
5. Some chains require a new pin (e.g. Shimano chains). Do not

break these chains unless you have a replacement pin.

Chain Installation

If a new chain is being installed, count the number of links in the old chain. The new chain should have the same number as the old one. Remove links as needed to make it so. If you are unsure about the length of your previous chain, wrap the new chain around your largest cassette cog and chainring, bypassing the rear derailleur. Where the chain meets up, measure two links (four pins) on one side then cut the chain. This will give you an accurate length for your specific drivetrain.

Adding and Removing Links

The chain will need to be lengthened or shortened if you change cassette or chainring sizes. You may also need to remove a damaged link during a ride.

1. To start, position the rear derailleur by moving it to the smallest cog.
2. Using the chain tool, join a narrow with a wide link that has a rivet sticking out of one side. It may be necessary to completely remove links from the end of the chain section in order to create this match-up. Reconnect the chain.
3. Lay the chain on the rear cluster, on the smallest cog, then thread through the rear derailleur and around the derailleur wheels. Put the other end through the front derailleur and around the middle (or smaller) chainring. If the chain is threaded so the loose pin is facing you, rejoining the chain will be much easier.
4. Set the two ends of the chain on the pegs of the chain tool (the outer pegs if there are two rows), and line up the loose pin with the pin driver.
5. Push the pin through the inner plates. If everything is lined up squarely this is a smooth operation. If not, no amount of force will make it fit. The driver will become harder to turn as the outer plate is reached. This is because the slightly wider rivet requires a small amount of force to go through the outer plate hole.
6. Push the rivet into the outer plate
7. STOP! Unscrew the driver and remove the chain from the tool. Check to see that the same amount of rivet extends beyond both outer plates as on the other links. If not, put the chain back on the tool and even it up.

Chain links should move freely. Binding is caused when the inner and outer plates are pushed together in the course of installing the rivet. A joint that binds will skip or jump under load.

To free up a tight link, use the second position of the chain tool, closest to the T handle. Place the chain on these pegs, then push the rivet from the opposite side it was put in from, turning the T handle about 1/4 turn after it contacts the rivet. If you do not have a chain tool with this feature, grab the chain on either side of the stiff link with your hands and twist it sideways until it turns freely.

Lubrication on a bicycle chain needs to get inside, between the rivet and the bushing. To insure smooth operation of the chain, the chain should be kept clean and dry so as not to attract dirt. Clean with an environmentally friendly solvent or cleaner. Lubrication must be renewed regularly, and especially after riding in the rain. When working with lubricants, remember that some cleaners and lubricants are flammable. Never work near a flame, especially not in the basement near the gas furnace.

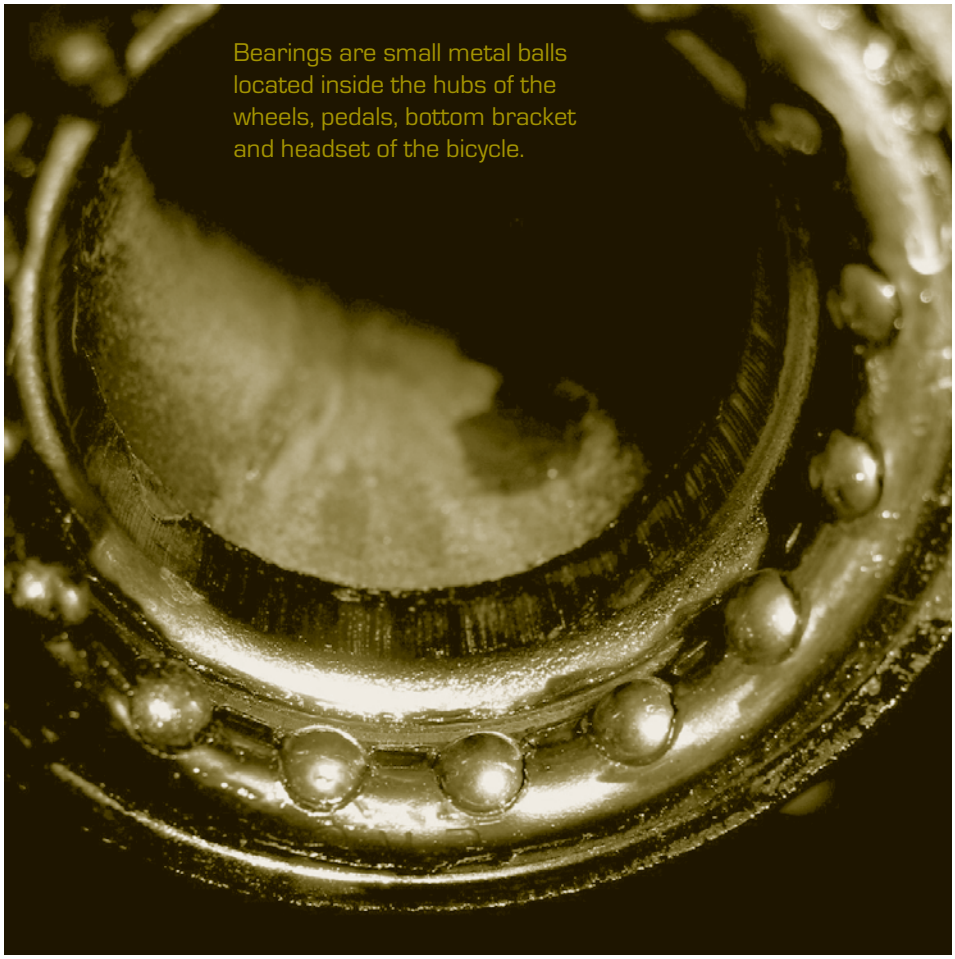
There are a variety of lubricants available through bike shops. Remember to never lubricate a chain with grease. Grease does not penetrate the chain and collects dirt and grit on the outside. Do not use grease; do not use WD-40.

Bicycle Bearings

When the moving parts of the bicycle are clean, well lubricated and adjusted properly, your bicycle will feel smooth and solid. The chain is the easiest of these moving parts to service. The others, however, do require attention. Bearings, small metal balls, are located inside the hubs of the wheels, pedals, bottom bracket and headset of the bicycle.

Ball bearings rotate in a housing. Whether the axle rotates inside a stationary shell, as in bottom brackets and headsets, or it is fixed and the shell rotates, as with hubs and pedals, the techniques used to clean, repair and adjust the bearings are the same. There are two sets of bearings, one at each end of the part.

The major responsibility of the cyclist is to know when bearings need maintenance. Bearings require clean lubrication. Lack of lubrication, bearing play, dirt or water can damage these vital parts.



Bearings are small metal balls located inside the hubs of the wheels, pedals, bottom bracket and headset of the bicycle.

Diagnosing Bearing Wear

Hubs

A properly adjusted hub will feel solid when you rock your wheel from side to side. Remove it from the bike and spin the axle between your fingers. It should be smooth. If you feel grit or binding, the hub needs to be adjusted. Only service the hubs yourself if you feel comfortable doing so. While hubs may not be very expensive, damaging a hub means replacing a wheel. Some modern hubs have sealed cartridge bearings which cannot be repaired and must be replaced.

Pedals

Rotate slowly to check for binding. Pedals should turn freely; check for play. While not all pedal bearings can be serviced, it is important to understand when the lack of lubrication begins to affect the operation of the pedals.

Bottom bracket

Most of the bottom brackets produced since 1993 are non-serviceable sealed bearing units.

If both of your cranks have lateral play in them, it is time for your bottom bracket to be replaced. Older bottom brackets need adjustment if there is bearing play. To diagnose the condition of the bottom bracket, remove both crank arms and turn the spindle in your fingers. If it spins without friction, it is likely that there is no grease lubricating the bearings. If the spindle rocks inside the cups, the bottom bracket needs to be adjusted. Consider replacing the bottom bracket with a newer sealed cartridge unit that

Hub

requires little or no maintenance after installation. Consult with your local bike shop, as there are many different sized bottom brackets with different spindle constructions.

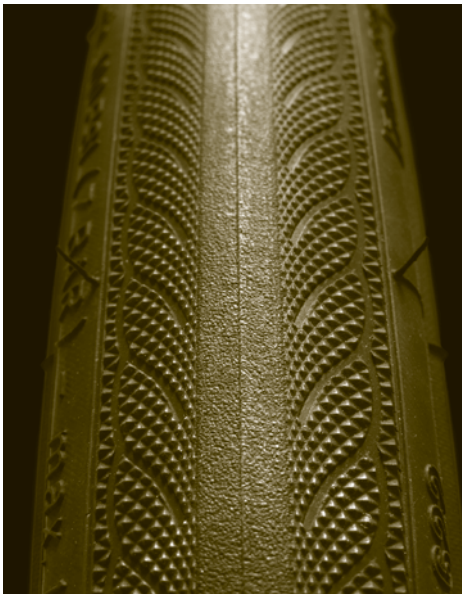
Headset

Headsets rotate, but are also subject to vertical forces caused by bumps in the road. These impacts are transmitted through the fork, into the frame via the headset. Precise bearing adjustment is critical.

Your headset should rotate freely from side to side. Binding indicates insufficient lubrication, too much friction caused by over-tightening or damage to the bearings. To check, squeeze the front brake lever hard and rock the bike from front to back. There should be no play or looseness.

Play or wiggle in these vital moving parts indicates a need for professional attention. Take your bicycle to your local bicycle shop for service. Tell the mechanic where the problem is.

To check for bearing wear, rotate the pedal slowly to check for binding. Pedals should turn freely; check for play.



Tire Wear

It's important to know how to detect tire problems before they turn into flats. Routinely and thoroughly inspect your tires for signs of wear. Look for:

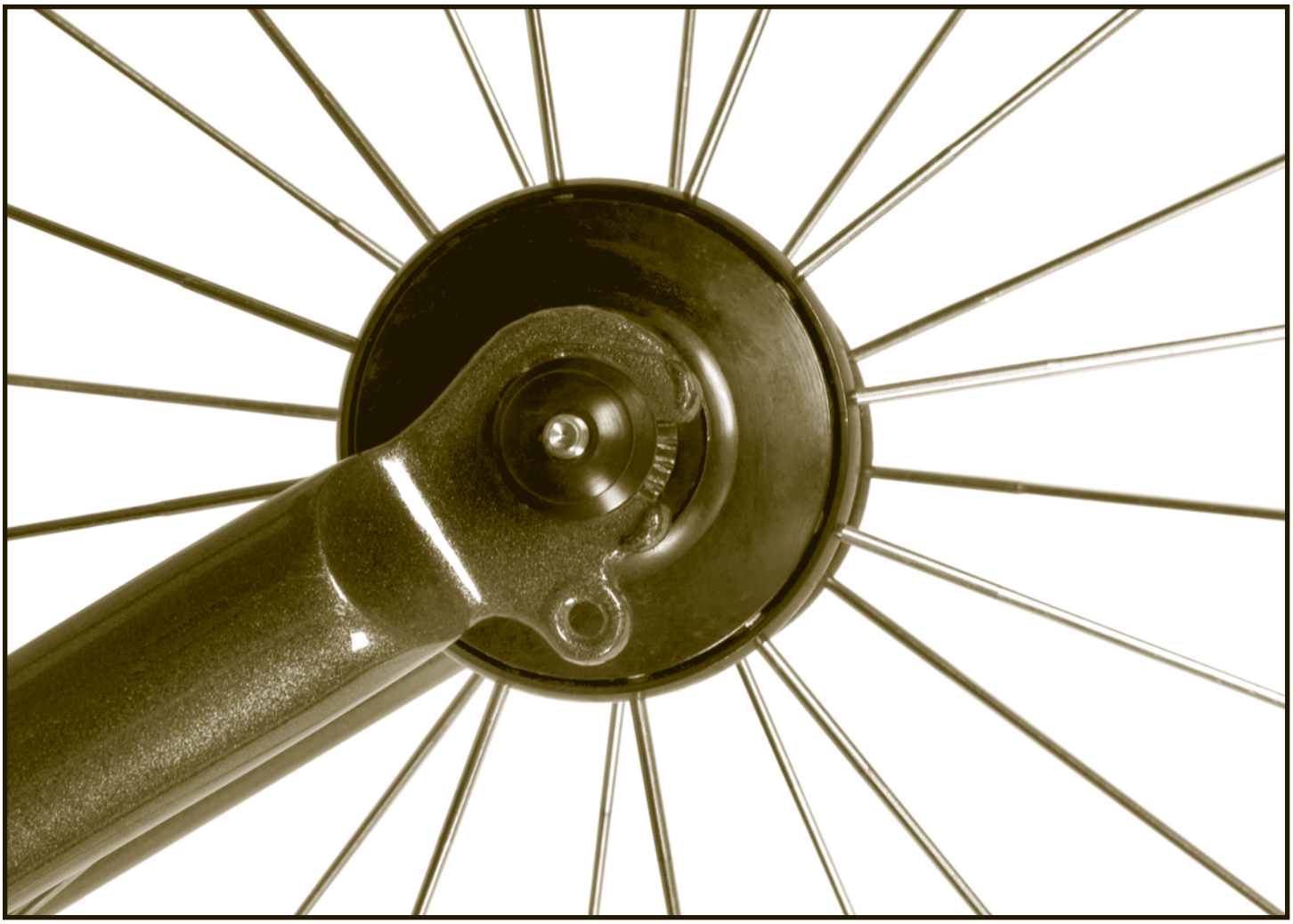
- tread which has worn smooth;
- visible threads — indicating the rubber has worn away;
- weathered and cracked sidewalls;
- worn sidewalls from brakes rubbing on the tire;
- side wall bulges;
- debris or cuts in the tread.

If you notice any of these signs of wear, the tire should be replaced. In most cases, the tube is still useable.

Spoke Tension

A properly adjusted wheel provides the cyclist a smooth ride. Lacing a wheel from scratch is an exacting skill and should not be attempted unless you are very comfortable with it. However, there will be times when you need to know enough about how a wheel is built to make necessary minor repairs or adjustments.

Properly adjusted spokes wear longer and are safer. Wheels with loose spokes are dangerous and deteriorate rapidly. Every time a wheel is used, the spokes accumulate some fatigue. It is important to know how to check your wheels for proper adjust-



Properly adjusted spokes wear longer and are safer.
Wheels with loose spokes are dangerous and deteriorate rapidly.

ment. Check each spoke for tension. One loose spoke can cause your rim to rub the brake, and result in extra energy use.

Test by touch

Grab two adjacent spokes in one hand and squeeze, feel for tension. Work your way around the entire wheel. Repeat this procedure for the other side of the wheel. All spokes should feel equally tight. Spokes should never be loose to the touch. Nor should they have extreme tension, which can cause a badly out-of-true wheel if a spoke does break.

Test by Listening

All spokes on a given wheel should make the same tone when plucked, except on the drive side of the rear wheel. The higher the tone, the tighter the spoke is. Conversely, the lower the tone, the looser the spoke is. Spokes on the drive side of the rear wheel are slightly shorter due to dishing of the wheel to accommodate the cassette. Therefore, spokes on that side of the wheel will have a slightly higher tone than spokes on the other side of the wheel.

Check for True

Wheels must be true and round. Correcting an out of true wheel is much easier than correcting one that is out of round. Check for trueness with the wheel on the bike. Spin the wheel and note its relationship to the brake pad. The rim should run consistently the same distance from the brake pads. If not, it needs truing.

Check for Roundness

A flattened rim (from hitting a pothole or a brick) cannot be corrected by adjusting spoke and requires special skills and tools. To determine if you have this problem, hold a ruler against the seat stays or fork blades about 1/8 inch above the rim, and spin the wheel. If the rim hops up or down more than 1/8 inch, you have a job better left to the pros.

To check for trueness, spin the wheel and note its relationship to the brake pad. The rim should run consistently the same distance from the brake pads. If not, it needs truing.

Wheel Truing Tips

1. Use a quality manufactured spoke wrench that fits your spoke nipples tightly.
2. Tightening a spoke on one side of the wheel pulls the rim in that direction.
3. Generally, if you tighten a spoke (or spokes) on one side of the wheel, loosen a spoke (or spokes) an equal amount on the other side of the wheel.
4. Tighten (and loosen) spokes only 1/4 turn at a time.
5. Tighten (or loosen) only the spoke at the spot most out of true. Adjust only 1/4 turn, then spin wheel to check for progress. Adjust adjacent spokes, in turn, as needed.
6. Keep working on the spokes at the spot that is most out of true.

PART III
THE CYCLING ENVIRONMENT

Cyclist Lane Rule

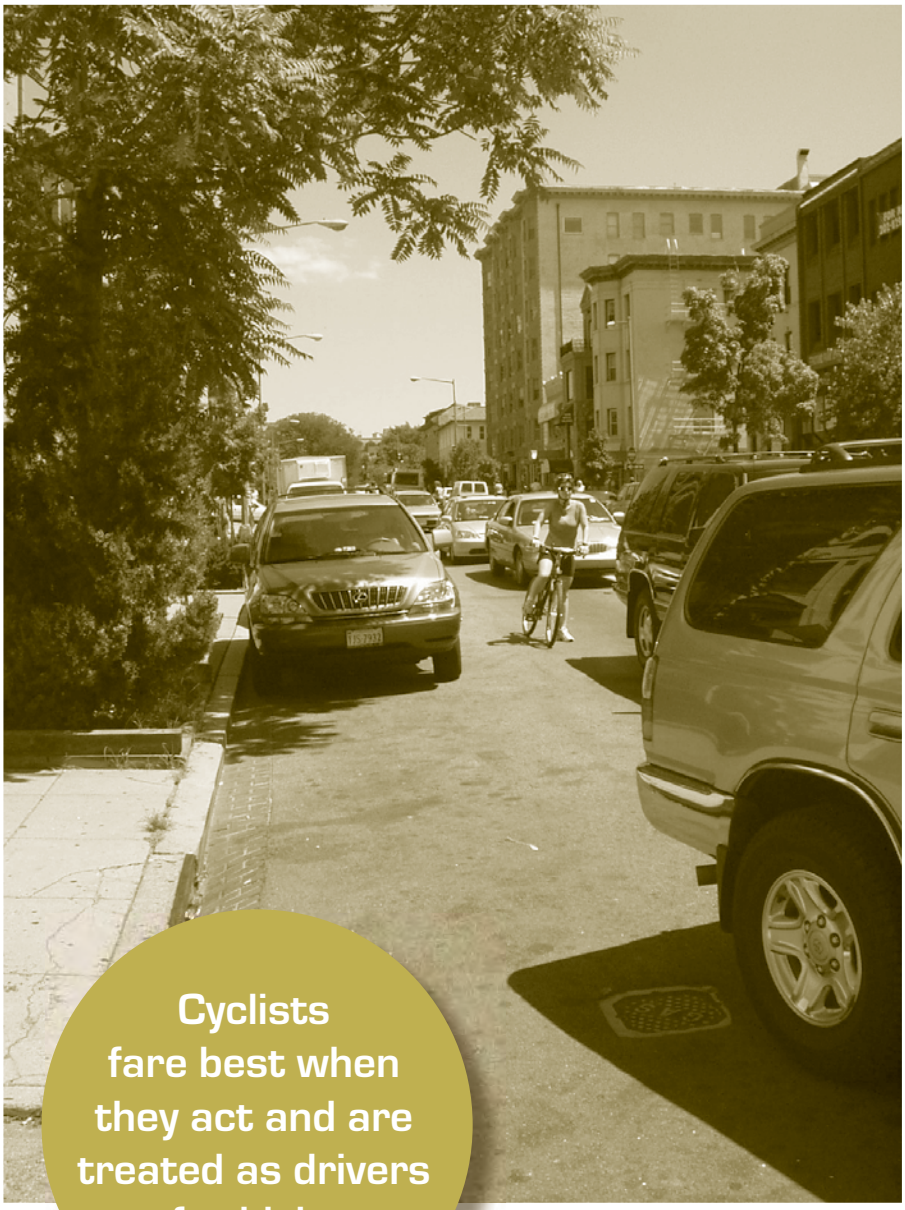
With very few exceptions, the safest way to ride is as part of the traffic, going with the flow of the normal traffic pattern. Bicyclists who ride this way get where they are going faster and, according to crash studies, have fewer crashes or collisions. By driving your bicycle as a responsible road user who follows the recognized rules of the road, what you are going to do next is clearer to other road users. Traffic law is designed to keep us all predictable. Cyclists are more vulnerable than other road users. Therefore, they must exercise better judgment and skill to travel as effectively and safely as motorists.

Cyclist Lane Rule

Select the right-most lane that leads to your destination.

The most important part of riding through intersections happens before you reach the intersection. Prepare by getting in the proper lane well in advance. Be confident about what you plan to do, and then do it smoothly and competently. Do not be diverted or stopped while you have the right-of-way, unless the other driver is clearly doing the wrong thing.

In most situations in which you must avoid another driver's error, it is better to rely on your maneuverability and narrowness to steer around and through a gap than it is to try to stop. When you stop, you lose your ability to steer and to get out of the way. Use your brakes to slow down, then release the brakes and turn.



Cyclists fare best when they act and are treated as drivers of vehicles.

Turning left from the left lane of a milti-lane one-way street.

Choosing a Lane and Position in that Lane

When approaching an intersection, position yourself in the lane with respect to your destination direction, on the right if you want to turn right, on the left if you want to turn left and between those positions if you want to go straight. Slower traffic is in the lane nearest the curb, and faster traffic is in lanes nearer to the centerline.

A roadway with multiple left turn lanes requires the cyclist to remember the lane rule and select the right-most lane turning left. The cyclist must then select the appropriate lane positioning based on what additional destinations that lane may serve and the lane width.

One-Way Streets with Two or More Lanes

If a one-way street is two or more lanes wide, laws in most states allow you to ride on either the left or right side of the roadway. When you make a left turn from a one-way street onto another one-way street, it's easiest to ride around the corner on the left.

The cyclist would turn left from the left side of the lane if there were little turning traffic; from the center of lane if both left and straight-through traffic is heavy.

Multi-lane and High Speed Arterials

On multi-lane arterials, motorists are able to change lanes to pass a cyclist, allowing for fewer delays. However, a higher level of vigilance is required by cyclists, especially as vehicle speeds increase.

If you feel uncomfortable with sharing the lane, the lane is probably too narrow to share. Let your comfort level be your guide on lane sharing. Wide curb lanes (more than 14 feet wide) provide the bike and car space enough to share side by side. For lanes 12 to 14 feet, the type, volume, and speed of traffic will dictate whether the cyclist shares the lane. Lanes less than 12 feet wide are too narrow for safe sharing, cyclists must claim the lane.

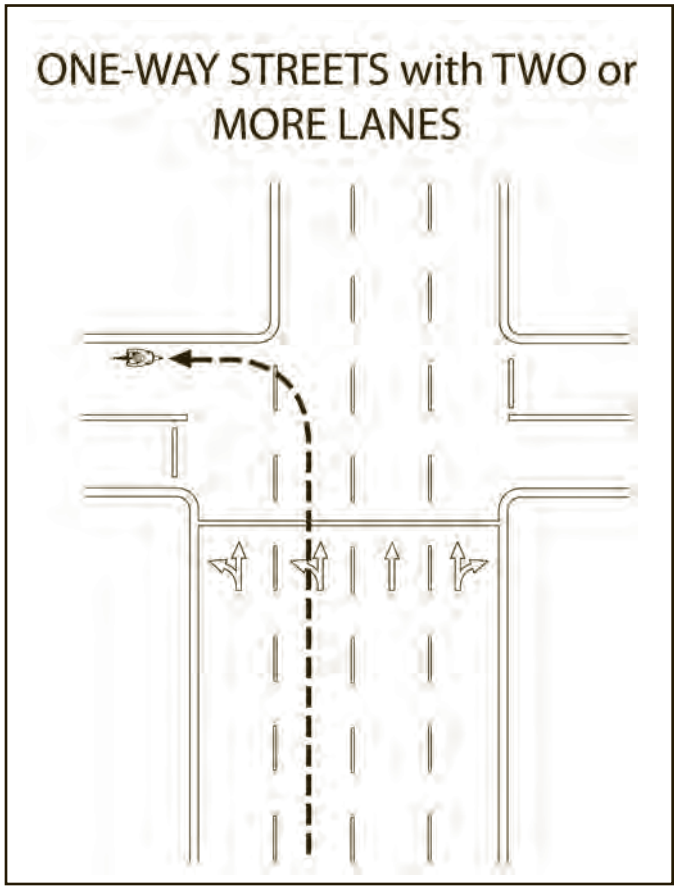
Lane Position

In wide outside through lanes (more than 14 feet) ride only far enough to the right to allow motorists to overtake you. Avoid riding all the way over to the edge or curb, forcing you to deal with road-edge surface hazards. Benefits of this lane positioning are numerous. The cyclist is more visible to traffic on all sides; it helps prevent oncoming or following motorists from turning directly in front you; there is a safety cushion to your right; and there is more clearance adjacent to parked cars.

Merges and Unions

Diverges and Separations

Places where two roadways join or split need to be treated with caution: Each of these creates risks for the cyclist. Often the angle of the merge or diverge is more shallow than a normal intersection, thus making it more difficult for motorists to see cyclists. Motorists are frequently traveling faster than they would through a regular intersection as they maneuver into position for their intended destination. Motorists also may not expect to see bicyclists in such intersections. Bicyclists must be attentive and visible, especially to traffic from behind. A rear view mirror is a great help in these situations and turning your head to look behind is also very important.

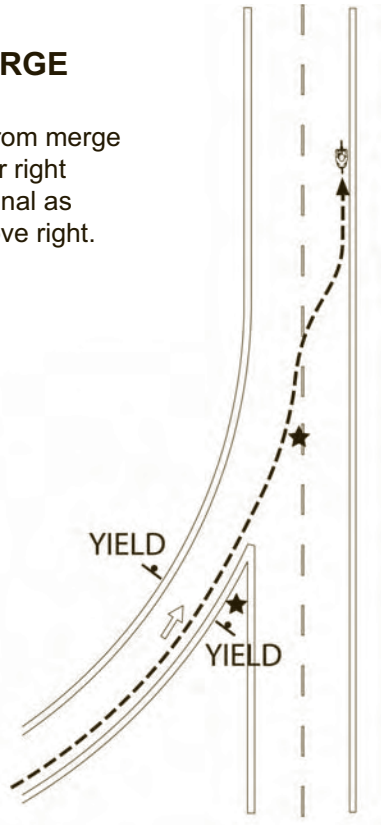


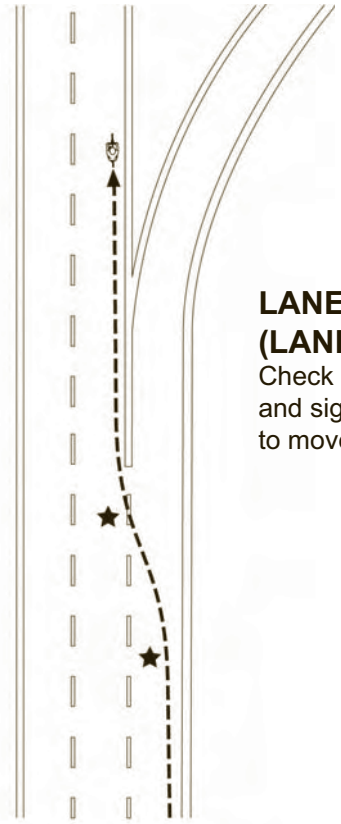
The Cyclist Lane Rule Applies

As on multi-lane, high-speed arterials, if the intersection requires you to cross more than one lane to get into position for your destination, and traffic is moving much faster than you, wait for a large enough gap in traffic so you can cross all the lanes at once.

CYCLIST MERGE FROM LEFT

Slow and yield from merge point, check over right shoulder and signal as necessary to move right.

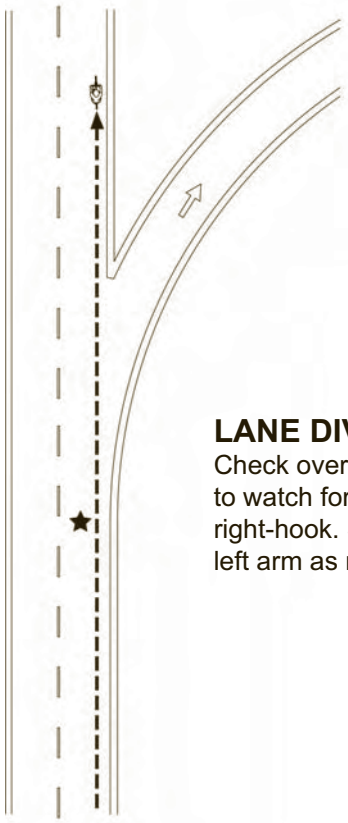




LANE SEPARATION (LANE DROP)

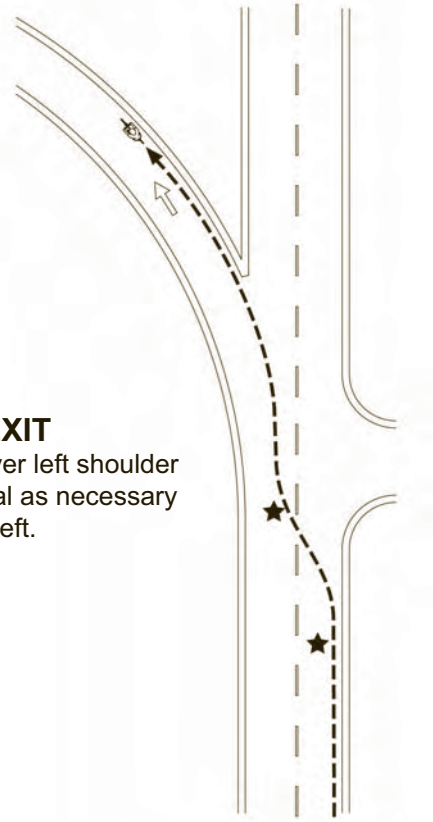
Check over left shoulder and signal as necessary to move left.

★ Star indicates look over shoulder to make sure path is clear.



LANE DIVERGE

Check over shoulder to watch for overtaking right-hook. Signal with left arm as necessary



LEFT EXIT

Check over left shoulder and signal as necessary to move left.

Bike Lanes

On a road with bike lanes, you should treat the bike lane as an extra lane for cyclists only (that is, a lane that cars are not meant to use) and follow the rule of riding in the rightmost lane that goes to your destination. If the bike lane has debris or parked cars or is otherwise hazardous, you are not obligated to use it.

NEVER make a left-hand turn from a bike lane unless it is one specifically designed for bikes turning left. To make a left-hand turn at an upcoming intersection, you will need to get to the center of the street or left-turn lane by making your two lateral moves per lane. You must begin the process of changing lanes well before the turn.

Bike Lane Benefits

Bike lanes provide benefits and some possible drawbacks for cyclists. Generally, because bike lanes are dedicated for cyclists, cyclists often have elevated rights when traveling in them. For example, motorists are not allowed to impede the flow of a bicyclist in a bike lane. Bicyclists are also generally allowed to pass cars in bike lanes on the right, when they normally cannot pass on the right. However, even though a cyclist has the right-of-way when going straight through an intersection, riders must be aware of right-turning vehicles that could cut them off. In a non-bike lane situation, bicyclists often may not be permitted to pass a car on the right. In the bike lane, cyclists may have the right-of-way but should overtake on the right slowly and cautiously when a motorist might turn right or open a car door.

Well-placed and well-designed bike lanes are safe and fun to use. Bike lanes and other bicycle friendly facilities have been shown to increase bicycling use, and with increased use and visibility, bicycling becomes safer and bicyclists more visible to motorists.

Trails

Shared use paths or trails can be great places to ride, especially when they run along old railway lines, canals, or other corridors. While they are free of motor vehicle traffic, you should be careful at intersections and be prepared for the unpredictable behavior of dogs, walkers, runners, roller-bladers, and even other cyclists! Watch your speed, as trails can often have tight corners and short sight lines that you wouldn't find on the road.

Above & left: Contra-flow lane markings.

Rider makes left-turn with traffic.

Poor Design

However, bike lanes may also be poorly placed and designed. Cyclists should watch out for these situations and possibly consider leaving the bike lane if it is in an awkward location. Sometimes, bike lanes are on busy streets, and there may be another safer, more enjoyable route to your destination. In addition, a bike lane may have debris and other problems that might lead you to edge out of it or ride in the traffic lane. It will ultimately be your choice on how you use or don't use bike lanes, so remember to follow these cautions and the basic traffic principles.

Above : Bike path comes to an end.

Freeways

In some areas of the country, riding on a freeway (usually an interstate) may be the only route from point A to point B. Before embarking on a freeway adventure, know whether this is legal in the state where you choose to ride the freeway. In states where bicycles are permitted on freeways, they are usually required to use the shoulder. Take care not to crowd the white lane edge line. Freeway shoulders are normally at least eight feet wide. Usually at least four or five feet of clean shoulder are available before encountering debris or gravel along the far edge. Traveling on the shoulder provides the cyclist a safer margin against wind blast from the large trucks, which make up a large percentage of freeway traffic. Be alert on freeway shoulders for various types and positions of rumble strips and raised pavement markers. Cross them with caution. Also watch for chunks of tire tread, which occur frequently on freeway shoulders.

Exit Ramps

Keep to the right until you have a large enough opening to cross the ramp and continue on the through shoulder. There will be times when you need to stop and wait for a gap.

Entrance Ramps

Cross the ramp where the merge begins and continue on the right shoulder.

Traffic Detectors

Traffic signals can benefit cyclists because they provide a controlled, protected intersection for the predictable bicyclist to negotiate. They are a problem when the bicyclist arrives at a red signal that does not turn green.

What is a traffic detector?

Many traffic signals are controlled by a piece of wire, called a loop detector, buried in the street. This detector will sense the presence of metal objects, similar to a metal detector. It will turn the light green when it detects a sufficient amount of metal in the coil's field. Sometimes a detector is not sensitive enough to detect a bicycle and rider.

Can a bicycle trigger a traffic detector? Absolutely!

Traffic detectors have several designs. Unless a road has been repaved since the detector was installed, you will be able to see the shape as you approach the intersection. The placement of your bicycle is critical to your being able to successfully trigger the detector. If the cuts form a rectangle or square, stop directly over one of the lines that is parallel to your direction of travel. If the rectangle has an additional cut through the center, stop over the centerline. If the cuts form a diagonal pattern, stop right over its center. If there are overlapping wires in the corners of the rectangle, stop there. None of this is necessary, of course, if a car is there to trigger the signal.

In some areas, video detectors are now being used to detect traffic and trigger signals. These devices may be mounted on the signal light and work by recognizing changes in the intersection. They will see you, although at night it helps if you have a light.

Uncooperative Traffic Detectors

Detectors of all types are, to varying degrees, effective devices for cyclists. As a cyclist, you are responsible for obeying traffic laws. A non-detecting signal prevents you from doing that. Report malfunctioning traffic detectors to the appropriate local traffic official. If you are at a malfunctioning signal, wait a reasonable amount of time, then treat it as a stop sign and proceed when traffic on the crossroad is clear. And, definitely report that signal!

Many traffic signals are controlled by a piece of wire, called a loop detector, buried in the street. The '+' symbol (above) shows where a cyclist will be detected.

PART IV

CRASH PREVENTION, AVOIDANCE AND INJURY REDUCTION

Knowing what may go wrong empowers the cyclist. You will have an increased ability to foresee potential crashes and avoid them; and, if unavoidable, know how to take suitable measures to reduce the potential for injury.

Crash Prevention

Be Predictable

By following the defined rules of the road for all vehicles, cyclists send a clear message of their intentions to motorists. Predictability is the major basis for all roadway safety; it is especially critical for cyclist safety.

Be Visible

Other road users more readily see a cyclist who prepares for riding by wearing brightly colored, reflective garments. It is important to position yourself clearly in the roadway and not ride too near the curb.

Be Alert

Just because you are following the rules doesn't mean everyone else is. Keep an attentive eye to what is going on in front of you (road surface conditions, hazards, oncoming traffic) and to the sides (motorists making turning errors).

Be Assertive

This holds implications for the cyclist when negotiating with motorists. If you, the cyclist, pause or hesitate, you are almost guaranteed that the motorist will take the right of way whether it is theirs or not. Know the rules of the road and follow them with confidence and conviction.

Be Courteous

Being assertive does not mean being aggressive. Treat other operators as you would like them to treat you. Recognize that there is a tension between being assertive and being courteous, and you must find the proper balance for your own safety.

Be predictable. By following the defined rules of the road for all vehicles, cyclists send a clear message of their intentions to motorists.

Avoidance

The bicycle is a highly maneuverable machine. The cyclist must be continuously alert and read the road ahead for special hazards that can cause a rider to fall. Maintaining the skills to perform emergency maneuvers requires continual practice. It must become instinctive for the cyclist. Mastering the art of performing emergency maneuvers provides the cyclist with an expanded sense of security, confidence and style.

Quick Stop

It takes practice to get peak performance from your brakes. Brakes must be in good condition. With pedals in the 3 and 9 o'clock position, transfer as much of your body weight as possible over the rear axle and apply the brakes hard (front brake harder than the rear). The bicycle should remain stable. The rear wheel should neither skid nor lift off the ground.

Instant Turn/Quick Turn

This technique enables the cyclist to turn inside a motorist's turn without losing control of the bicycle or colliding with the motor vehicle. To execute a quick turn to the right, the cyclist must first steer momentarily to the left to initiate body lean to the right, and then steer hard to the right.

Quick stop

Demonstrating the instant turn.

Cycling Hazards

Injury Reduction

Wearing a helmet on all rides is important for rider injury reduction. A well-cared for, properly sized helmet, worn correctly is the cyclist's best injury reduction equipment available. A helmet should always be replaced after any crash where it has contacted the ground. It may or may not appear damaged to the naked eye. However, the helmet material may become compressed and therefore reduce its ability to protect the cyclist. A frequently used helmet should be replaced about every three years.

Cycling gloves can also provide important injury reduction. Not only do gloves cushion the cyclist's hands while riding, they often provide protection from road rash during contact with the pavement. Shoes with a firm sole and wrap-around glasses are also important.

By being alert and attentive you can avoid many potential crashes. Actively looking is better than being reactive.

Surface Hazards

Surface hazards can often be avoided you pay attention to the road surface in front of you. It is far easier to plan to steer around a hazard than to have to initiate an emergency maneuver because you weren't watching ahead.

Stay alert and keep watch for:

- pavement holes
- pavement cracks,
- road edge deterioration
- edge drop off
- pavement joints
- loose sand, debris or glass.

Railroad or trolley tracks and drainage grates often need to be crossed at an angle that requires planning ahead. You may need to move into traffic in order to cross them at a correct angle.

Steel plates used during road construction may cause a pinch flat and are slippery when wet. Care should be taken if your path of travel requires you to cross them.

Eventually, all cyclists come across other surface hazards, including wet utility covers, line marking

Railroad or trolley tracks and drainage grates often need to be crossed at an angle that requires planning ahead.

tape, construction, and sign posts. Take care to be attentive and alert. Plan ahead and remember that these hazards all require extra attention in the rain!

Visual Hazards

Being seen when riding in various degrees of darkness is always a serious consideration for cyclists. Darkness makes it difficult for you to see upcoming hazards and makes it extremely difficult for motorists to see you. Dusk, the half hour or so before and after sunset and sunrise, is as dangerous as darkness. Be prepared if you think you may be out during this time. Be sure to have appropriate lighting and wear light-colored, reflective clothing.

Sun glare can be blinding to cyclists and motorists. When you are riding early or late and the sun is near the horizon, be extra cautious because visibility is reduced.

Other weather and environmental conditions such as rain, fog or wind

may obstruct your ability to see ahead and the ability of other road users to see you. Chose your place on the road with extra care when encountering these visibility impairments.

Objects such as parked or moving vehicles, fences, bushes or other landscape vegetation, buildings and pedestrians, can block your view of other traffic. Approach these objects cautiously, control your speed and be alert to what you may be unable to see until the last moment.

Moving Hazards

Moving hazards are probably the most difficult to foresee or predict. Motorists who do not follow the rules of the road or respect your right to share the road may test your bicycle handling skills. Stay alert and communicate with motorists.

Other cyclists and wrong-way cyclists are frequent causes of collisions.

Car doors may be opened unexpectedly. Ride far enough away to safely clear an opened car door.

Cars leaving parking spaces can be avoided by staying attentive to whether a car has a driver sitting in it and the motor is running before you pass it. Be alert in case the unexpected occurs.

Pedestrians do have the right of way in crosswalks. When you are driving your bicycle as a responsible road user you have a pretty good idea of what to expect from other road users. Pedestrians, however, often dart across the street mid-block in front of you or do other unsafe things. They often think that you are traveling the speed they would be if they were pedaling their bicycles. You will need to be aware of the pedestrians around you and be prepared to stop quickly.

Moving hazards are probably the most difficult to foresee or predict. A car leaving a parking space (above) or an unexpectedly opened car door (below) can cause a crash or injury. Stay alert!

Rural Road Riding

The Rule for Riding Rural Roads is:
Keep as Far to the Right as Practicable!

Rural roads are typically narrower than urban roads, and often have no shoulder. Motor vehicle speeds are often higher. Combine the narrow roads with higher speed and motorists may have more problems in overtaking cyclists. The motorist may have to cross into the opposing lane to pass. Many motorists are reluctant to cross the double yellow lines even if no oncoming traffic is present. A motorist passing an oncoming car will be in the cyclist's lane and approaching head-on at a very high speed. Higher speed difference between motorist and cyclist may give the motorist less time to react to presence of the cyclist. Horizontal and vertical sight distances are sometimes poor due to curves, hill crests, embankments and vegetation near the edge of the road. Also, rural roads are not usually lighted at night. Does this mean the cyclist should not ride there? Absolutely not. Rural roads are often a most delightful place to ride, so long as the cyclist is prepared.

Be Visible

Wear bright colored or reflective clothing and your helmet. While very infrequent as a percentage of all types of car-bike collisions, rear-end collisions are about four times as frequent on rural roads as on urban roads; and they usually occur at usually at night. Avoid riding rural roads in the dark. If you must, use bright lights and reflectors.

Watch for Oncoming Traffic

Head on collision can be the result of one motorist overtaking another while coming toward you. Watch for a line of traffic coming toward you, when there is no traffic coming from behind you. In this situation, sit upright, move farther into the lane, and be especially watchful for the driver who peeks around the lead vehicle. When you see a motorist do this, wave your left arm repeatedly in a full arc, to gain the driver's attention. If they still pull out to pass, brake, and leave the road quickly.

Dogs

When dealing with dogs the consequence of a collision is greater than that of being bitten. Always think first to maintain the control of your bicycle. Quit pedaling and shout at the dog, "No! Bad dog! Go home!," outrun the dog, or slow down until past its territory. Stop if necessary, dismount, then put the bike between you and the dog. Some dogs just like to chase moving objects, so if you stop, the chase ends. Many jurisdictions have leash laws. Do everyone a favor and report the dog. An owner who gets fined for an unrestrained dog may discontinue that habit.

Bad dog! Go home!

Wind Blast

A distinct hazard in rural areas with large open spaces and large trucks passing relatively close at high speeds is an unexpected windblast. The passing truck pushes air in front of it, and then creates a partial vacuum behind it, as it moves past you. This will first push the cyclist to the right, and then pull them to the left. Be prepared to counteract these forces by adjusting your lean. Give overtaking trucks as much room as you can, and slow down if necessary to reduce the risk of injury and damage.

Shoulder riding on rural roads
If a shoulder is present, ride far enough to the right to allow faster traffic to overtake without crossing the centerline or changing lanes. Where motor traffic speed is much greater than cyclist speed, ride further to the right. Remember to consider the need to scan ahead for surface hazards, which are common on rural, less well-maintained roads. Shoulders often deteriorate quickly and may end abruptly. Plan ahead to merge with traffic on the roadway and remember to consider the longitudinal cracks or seams between roadway and shoulder that often exist. This movement onto the roadway should be considered a lane change. Look behind, signal and yield to traffic before moving left onto the roadway.

Curves

A right-hand curve with reduced visibility such as a wall, embankment, or vegetation, places the cyclist momentarily in a motorist's blind spot. To reduce this blind area the cyclist should move to the left side of their lane as they enter the curve. If it is safe to do so, this will enable the cyclist to be visible slightly sooner to a motorist coming around the curve behind them. The cyclist should move back to the right when a car comes into sight of them, or as they finish the curve.

Climbing and Descending

Climbing

It is safe to say that a cyclist will usually be the slowest vehicle on the road when climbing a hill or mountain. Therefore, keep as far right as practicable. This is especially important at the hill crest and just over, when visibility distance is the shortest. Shift to a lower gear before starting to climb. If possible, select a gear to maintain 70-90 rpm, and remember that waiting too long to shift creates hazards.

Lung capacity is helped by riding in an upright position, on top of the handlebars on a road bike; or as straight up as possible on a mountain bike. Stand up periodically to stretch your legs. Plan to drink and eat during the climb, if it is a long climb. Plan ahead to have enough water available.

Descending

A downhill is a welcome relief after a long climb. Stay well away from the right edge of the roadway. The bicycle may go as fast or faster downhill than cars. In this case, depending on the posted speed of the road, and the speed of the cars, take the lane.

Control your speed at all times during a descent. Hazards may appear suddenly, leaving you little time to react. Try not to exceed posted speed limits. Negotiate curves by leaning instead of steering and keeping your inside pedal up. Lean into the corner, then slowly straighten while exiting to reduce the need for braking. Pay special attention to debris in curves and on adjacent shoulders. These can greatly increase the risk of skidding

falls, especially if you must brake. Cyclists should keep their hands placed in close proximity to their brake levers at all times while descending.

Braking Technique for Curves and Descents

Brake before entering a curve, release the brakes, and then coast through. Using brakes in a curve will reduce the traction of your tires on the road. Use the brakes equally and sparingly on long descents. Heat buildup from prolonged braking can cause a blowout. Keep motorists following you informed by signaling your actions, such as a slowing/stopping signal. Sit up to create a larger frontal surface to act as an airbrake. Your bicycle may shake at high speeds. If it does, brake, grip the handlebars tightly and squeeze the top tube between your knees to slow the shaking.

Control your speed at all times during a descent. Hazards may appear suddenly, leaving you little time to react.

Group Riding

On group rides, riding in formation is a good technique to reduce your interference with other traffic. Riding in formation allows cyclists to cut down on wind resistance and increase efficiency.

A large group riding in formation may obstruct the normal flow of traffic. There are times when it is desirable to shorten the line of cyclists by doubling up. To do this, the front rider checks for overtaking traffic, moves left, and slows speed slightly, thus signaling to each alternating rider in the group to do so also. The riders on the inside (closest to curb) increase speed slightly until they are traveling in alignment with the outside riders. The group is now half as long as it had been. This technique requires practice by the participants, as the riders are often quite close together. You have to pay constant attention to the other riders, especially the one in front of you.

Riders also need to know how to return to single file. The front or last rider in line calls the signal to single-up. The inside rider speeds up briefly to make space for the outside rider to transition to single file. The outside rider slows slightly and moves in behind the inside rider as space is made.

During these maneuvers, watch the rider in front of you to avoid overlapping wheels, which could result in a crash.

Weather

Hot Weather Riding

A very important consideration when riding in the heat is to dramatically increase consumption of fluids. In hotter weather, drink more electrolytes for nutrient replacement. Take rest stops in the shade whenever possible, and plan your route for stops at cool places. Dehydration first evidences itself as nausea; it is not a pleasant experience and can have serious consequences. Plan ahead and be prepared.

It is important in hot weather to keep the body as cool as possible. Bicycle jerseys constructed of wicking style fabrics are a good way to keep cool. Sunscreen, especially on the back of your neck, ears, nose, inside of arms and back of legs is also important.

Your tires will need special attention on hot weather rides. Air pressure expands with heat so reduce your air pressure on very hot days to reduce tube blowouts. Park your bike in the shade when not riding. Very hot road surfaces contribute to heat build up, as does braking on descents. Brake lightly and often.

Cold Weather Riding

When riding in the cold, it is important to remember that fluid consumption is vital as the body still perspires. You may be cold at the start of your ride, but it usually doesn't take long to build up body core heat.

Body core heart will not keep your fingers, toes, nose or ears warm. Remember to take care to protect these

extremities from frostbite and wind chill. You need to be able to remove or add clothing as you ride. Fabrics that wick are more comfortable. Loose insulating layers will trap air between them, which is vital for circulation and temperature control. Eyes get cold also, so wrap-around sunglasses or ski goggles are good protection.

Make sure you are dressed warmly enough so that if you have to stop for an extended period you can stay warm.

Wet Riding

Maintaining clear vision when riding in the rain is vital. Road grime, rain, and spray off other vehicles are all serious inhibitors of being able to see where you are going. Rain creates a visual dullness for all road users. Visibility, both yours and others, is critical! Wear a bright yellow rain suit, use a bright headlight and equip your bicycle with a red rear light. Take extra measures to be seen. Blinking lights help alert other road users to your presence. Staying warm is another vital health consideration. It is better to be perspiring than to be shivering in a cold rain. Select rain suits with vents and zippers to provide ventilation.

Few people find riding in the rain optimum conditions for cycling, but sometimes you just have to. Try to make yourself as comfortable as possible. A disposable shower cap (the kind they give you at hotels) makes a great helmet cover or seat cover to keep rain from running through your helmet and into your eyes. A visor on your helmet helps deflect rain.

Fenders and mud flaps, both front and rear, help keep bicycle wheel spray from getting on the rider. Brakes don't grip wet rims quickly. Plan ahead to stop and expect much longer stopping distances. You will need to pump your brakes to squeegee the rims dry before they will begin to brake effectively. After riding in the rain, clean and lubricate your chain and derailleur. Bicycle bearings will also need cleaning and lubrication more often after rain riding.

You must be extra attentive to road surface conditions when riding in the rain. Wet roads are slippery. Tar, grease, and oil accumulations mixed with rain reduce the traction of bicycle tires. Road hazards are even more dangerous when wet. Go easy on curves; reduce speed and sharpness of turn to reduce the possibility that your bicycle may slide out from under you. Standing water and piles of wet leaves should never be ridden through — they can camouflage surface defects.

If you ride near the ocean or on roads that are salted in the winter, you need to give your bike a bath in clear water frequently. Be careful not to use a high-pressure stream on your bearings.

Riding After Dark

Reduce your speed

This is especially important on roads you do not know. Surface obstructions and defects are harder to see at night. Stay alert! Motorists do not expect to see you. Nighttime brings a higher incidence of impaired motorists due to fatigue, poor night vision, and alcohol. Remember that wet roads reduce the effectiveness of headlights. Relatively dim bicycle lights may get lost in a mass of brighter lights, so never assume a motorist has seen you. Always assume you are invisible! Make every effort to properly equip yourself and your bicycle for optimum visibility for everyone.

Intersections

Be extra careful at intersections and when making left turns. Motorists are not expecting to see you. Do not get caught in an intersection as the light turns red. Slow down if necessary so you can stop on the yellow. Generator lights reduce your acceleration ability, so sprinting is more difficult. If you must wait for on-coming traffic before turning left, stop before entering the intersection, not in it, as you would in daylight.

Lighting Your Bike

It is a good idea to take a nighttime survey once you have your bicycle equipped as you would like. Have someone else ride your night-equipped bike with your personal visibility gear to see how easily they can be seen. Then make any necessary adjustments for optimum visibility.

Most state laws identify a headlight and red rear reflector for riding from dusk until dawn. Reflectors and lights lose effectiveness when dirty, so keep them clean. What lighting you select depends on your riding environment (lighted city streets, dark rural roads, etc.) and conditions (rain, fog, etc.). Lights can be either battery or generator powered.

Left: bicycle headlight

Regardless of the type of light you select, remember to carry a spare and the tools necessary to change it. Not having a spare could make for a dark, dangerous ride. Dual headlights give you a ready spare.

Visibility from the Rear

A red rear reflector is the law in most states. A yellow reflector, which is more reflective than red, may be an acceptable supplement. Rear lights offer a steady and blinking light. Where and how you mount the light or reflector is very important. Lights are designed to be mounted in a very particular orientation for maximum visibility. Mount lights high enough on the bike to be visible. The seat post is the highest part of the bike, and an excellent place to mount a taillight. Be careful not to block the light with cargo or bags

on the bicycle's rear rack. Rear rack mounted lights are also good, but subject to vibration that can break the mount. Mount reflectors low enough to be visible within the low beams of most motor vehicles. A good location is the left seat stay.

Helmet mounted lights offer flexible movement of the light beam. A white light mounted on the front of your helmet enables a more selective view of possible hazards in front or to the sides. The movement of helmet-mounted light often causes motorists to question what they are seeing and then decrease their speed. A good choice is to combine a bike-mounted light and helmet light for optimum visibility.

Additional protective equipment is desirable when cycling in limited visibility. Items to consider include: reflective clothing such as vests, leg and wrist bands; reflective stripes on clothing or shows; pedal or spoke reflectors; reflective tape on crank arms, panniers, or other parts of the bike; and reflective tape on your helmet. Remember that reflective material gradually loses effectiveness as it wears, and needs to be replaced periodically.

Red bicycle taillight.

Note that clear blinking lights are illegal and ineffective as front lights. The more you look like a Christmas tree, the more visible you will be to motorists when riding at night.

SMART CYCLING
RULES OF THE ROAD

1. FOLLOW THE LAW.

Your safety and the image of bicyclists depend on you. You have the same rights and duties as drivers. Obey traffic signals and stop signs. Ride with traffic; use the rightmost lane headed in the direction you are going.

2. BE PREDICTABLE.

Make your intentions clear to motorists and other road users. Ride in a straight line and don't swerve between parked cars. Signal turns, and check behind you well before turning or changing lanes.

3. BE CONSPICUOUS.

Ride where drivers can see you; wear bright clothing. Use a front white light and red rear light and reflectors at night or when visibility is poor. Make eye contact with drivers. Don't ride on sidewalks.

4. THINK AHEAD.

Anticipate what drivers, pedestrians, and other bicyclists will do next. Watch for turning vehicles and ride outside the door zone of parked cars. Look out for debris, potholes, and utility covers. Cross railroad tracks at right angles.

5. RIDE READY.

Check your tires have sufficient air pressure, brakes are working, chain runs smoothly, and quick release wheel levers are closed. Carry repair and emergency supplies appropriate for your ride. Wear a helmet.

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