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What you might want to know as a first time driver

The rookie chronicles

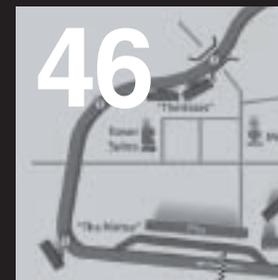
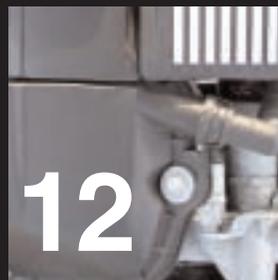
A new GVC BMW CCA member documents the advice he received in a year of Performance Driving Schools at Watkins Glen, Mosport, and Batavia International Motorsports Park. **Next >**

Part 1 Jeffery Gabel BMW E46 323i + E46 M3





Forward: In October of 2004 I bought a used silver BMW E46 323i Sport. The day I picked the car up from the dealer, I drove some distance to visit relatives, and while alone on a “spirited” drive through the twisting vacant farm roads in the upper hills of Elmira New York several things occurred to me about my new car. The car was happiest at 5000RPMs, it was extremely well balanced, had torque to spare throughout the powerband, and went explicitly, quickly, and precisely where the driver pointed it. It was then I thought it might be wise to learn, as the driver, where and how to “point this thing,” and began contemplating the concept of a driving school. This was, unlike any previous car I had owned, a performance machine whose potential would be severely wasted in the daily commute to work. I was fortunate to have a co-worker who had 12 years of experience as a BMW certified driving instructor, and was an active member of the Genesee Valley Chapter who suggested that I join the national and local BMW Car Clubs. I soon joined both clubs, registered for the driving school, and set about attempting to educate myself about what to expect, and how to prepare for this event. What I found as a new driver entering this world was how little I knew, and how little information was out there on what I needed to know. I found myself in my more experienced co-worker’s office daily asking lots of questions. He was kind and patient enough to explain some of the basics such as “why I would be driving with my windows down” to the more complex discussion about “why I should care about the dry boiling point of a hygroscopic brake fluid.” What follows is a collection of advice, tips, wisdom and council I received from instructors, students, friends, and others, as well as information I gathered independently that I found helpful before my first track day. Much of the content, as it turns out, is provided in some form after you are an accepted student, and your instructor will help you in ways this document can not. But, in advance of that, and for what it’s worth, here is the notebook of a first time driver. [Next >](#)



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! > This symbol, repeated throughout this document, represents content that is important to first time drivers.

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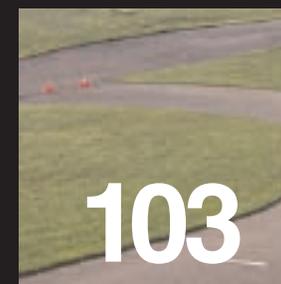
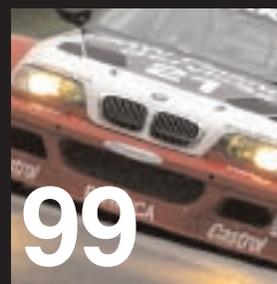
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Getting Started

Hitching a ride. Within many driving schools, there is a hidden learning opportunity of which few take advantage. The privilege of riding with instructors. At some schools, the instructors arrive a full day before the scheduled event opens and participate in their own track sessions and run schedules. While not widely promoted, it is acceptable to show up a day early and go for drives in the instructors' cars.

Check in with the registration desk, and let them know what you're there for. You will need to fill out a form and sign a waiver. You will be issued a wristband that allows you to sit as a passenger, but not drive. [Next >](#)





This additional seat time in advance of your own driving allows you to become familiar with the track, the elevations, corner sight lines, the braking points, turn-in points, apexes, and track-out points. It allows you time to memorize the flag stations locations, and will give you a great mental picture of what the track looks like when driven properly. I got in and out of so many cars, I acquired the nickname of “track whore” from the track stewards - a monicure I accept with self educational enthusiastic pride. The following morning when my run group pulled onto the track, I felt more at ease and prepared, for it was not my first time on the track.

I was fortunate enough to drive with Will Zaraska in his Euro 1987 E30 M3 pictured on the left, as well as “Cookie” in his M3 coup, Doug Hood in his yellow S2000, and Geoff Atkinson in his black M3, just to list a few.



Don't be shy about asking for rides, as most instructors love to have someone in the other seat. Once you've ridden with an instructor, ask another one. Each has their own style and if it is at all possible, get an instructor with a car similar to your own. The lines taken with front wheel drive cars may be slightly different from rear wheel drive cars. Finding a car of the same model as your own will give you a good idea as to its potential performance and handling characteristics. [Next >](#)



“It is better to go into a corner slow, and come out fast rather than vice versa.” Ross Bentley

When you ride with an instructor keep a few things in mind.

1. They know what they are doing. If they didn't, the chief instructor would not have invited them. They will be going very fast and things happen in a big hurry. Most of them don't mind you talking to them, but ask just to make sure. Introduce yourself and be very polite. Instructors aren't paid. If they derive any benefit from attending and teaching over the weekend, it's their open track time, and you're sitting in on it.
2. Don't compare yourself to the instructors. They have years of experience and know how their car will react at any given moment. Forget about the speed and watch the line they take in the turns. If everything is done right, the car will naturally hit the apex and track out to the proper position.
3. Watch their hands and feet. The biggest secret to high performance driving is BE SMOOTH.
4. The majority of drivers I sat in with had fully prepped cars with cages and “R” compound race tires. This allows them to “lean” really hard on their tires through a corner. Do not assume your street radials will perform in the same fashion.

Notice their their steering input, throttle application, braking and shifting will be smooth and no more harsh than necessary. They should not be making any unnecessary movements of the steering wheel, turning it only as far as it takes to get the car through the turn.

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Braking will be firm and definite. The car will slow to the right speed and then the brakes will be gently released. Downshifts will be barely noticeable except for a rise in engine revs.

The throttle will be applied smoothly and when the entire lap is finished you will notice how gentle it all seemed. The best ones are so good it seems effortless.

Wake up call: There are several keys to having a great first school. First and foremost is get there early. Absolutely nothing is more unnerving and creates more anxiety in first timers than being late. If you miss the drivers meeting, you will be penalized by losing your first session on the track. Plus if you're early, you're less likely to make mistakes in your paperwork, cleaning out the car or missing a tech inspection.

The Watkins Glen Track opens at 6:00am. Jim Dresser advises: "The local Sheriff at Watkins Glen will ticket any vehicles that are parked outside of the track, before 6:00am," so while you should arrive early, don't arrive too early. "Once at the track, you will have to sign a waiver at the gate to get into the track. After signing, follow the road up hill, through the tunnel, and into the infield. Ahead you will see the 3 story timing tower, and the big, tan, Kendall Garage. Head in that direction. The big Kendall Garage is reserved for instructors, but you may park anywhere else, except for the area designated by orange cones.

! > First time drivers are encouraged to find their instructor and park near them."

You'll begin the day with a group meeting with the classroom instructor and the chief instructor. They will go over the rules of the track, what the flags mean, how to pass properly and about a dozen other things you'll need to know to have a safe enjoyable weekend.

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7.

The typical miles per gallon you will get with your throttle wide open for twenty minutes.

The track covers 3.37 miles, and you will drive at least 100 miles per day. Start each day with a full tank. You'll likely get only 7-10 mpg.







What the ultimate driving school is not: If no one has told you yet, this is not a racing school, so let's get one thing out of the way; failure to follow the rules and/or listen to your instructor will make it necessary for the club to refund your money and ask you to leave. If your attitude is really bad, the refund may be optional. Please don't embarrass the folks running the school by making them embarrass you.



Once your car has passed "tech" you will be issued a sticker to place in the upper right corner of your windshield.

Cleaned out: The first priority is to clean out the car. Every loose object must be removed from the trunk, passenger's compartment, and glove compartment. This includes your garage door opener and your spare change. The most important area to check is under the front seat. Objects tend to gravitate to this area and you won't notice them until you get on the breaks really hard. Invariably they roll or slide under your feet. Going into a braking zone is not the place to have something jam under the pedals. Any item that is not attached needs to be removed. All floor mats, front and rear, should be removed to keep them from sliding around, even if they have Velcro style attach points. Your jack and spare tire are O.K. if securely bolted down, and may be included in your weight distribution for balance.

Tech Inspection: After you have the car clean, the tech crew will perform an inspection to check everything including your helmet. They will check the trunk, under the hood and the passenger compartment to make sure the battery is secure, all loose objects are removed, and there are no fluid leaks. They will check the Snell sticker in your helmet. **!** > The inspector will be looking for a Snell 2000 or later rating, "M" or "SA" sticker most commonly found under the interior lining inside the top of your helmet. (There is more on those ratings and their meanings in the "Safety - Helmets" section of this document) [Next >](#)



As follows is a list of items that may be checked at a tech inspection:

General: No excessive body or chassis corrosion.

Tires: Minimum tread depth 3/32", good sidewall condition, minimum pressure of 32 lbs.

Brakes: Sufficient pad thickness, 75% pad remaining - brake lines must not be abraded, cracked, or exhibit excessive corrosion. Brake dust shields must be removed.

Brake fluid: Changed in last 3 months. Vehicles with discolored and/ or obviously old brake fluid will not be allowed on the track.

Shocks and suspension: Mounting points must be secure and in sound condition. Vehicle must not have excessive side to side height variation. Shock absorbers must provide adequate damping and be securely mounted.

Steering: Must not exhibit looseness, play or binding throughout the range of travel. Steering box mounting must be secure. Power assist fluid must be at adequate levels.

Wheel bearings: Must be properly adjusted and not exhibit looseness. No lube leakage onto the brake linings.

Battery: Securely mounted and have no fluid leaks or corroded mountings.

Lights: Brake lights, headlights, turn signals all must work.

Seat Belts: Equal restraints for driver and passenger, 3 point belts are the minimum accepted.

Exhaust: Must be securely mounted and in good condition.

Windshield: No major cracks.

No fluid leaks: No coolant, brake fluid, or fuel leaks. No excessive oil leaks. Coolant levels must be adequate.

Motor mounts: Not broken or cracked.

Throttle linkage: Must exhibit free return without binding through the entire travel.

Seats: Driver and passenger seats must be in sound condition and securely mounted. All cars must have passenger seats.

The above list, or something relatively close to it, will be provided as a form after acceptance to a school session. The car should be inspected and the form filled out no more than four weeks prior the date of the school. [Next >](#)





Wristbands: You will be issued a plastic wristband at the track registration. Put on your wristband, and don't cut it off on the first night. Wrist bands are mandatory for access to the track surface. It is a common courtesy and practice to hold up your wrist, exhibiting your wristband for the track stewards when leaving the staging area.

Parking: The interior of the garage is reserved for instructors, so, you'll be parked outside in the Kendall parking lot. The location you claim in the morning will be yours for the day. It is best when you arrive in from a run to open your hood to assist engine cooling, and park in a level spot. You should never apply the parking break after a track session. The calipers of your emergency brake will likely be welded to the hot rotors. Simply find a flat spot, turn off the engine, and leave the car in gear. [Next >](#)



Snell M95 helmets will be replaced with Snell M2000 helmets in 2007.

Tech inspectors will check the Snell sticker in your helmet, and once approved, a BMW CCA sticker will be applied to the outside of the helmet indicating your helmet has passed the inspection. The inspector will be looking for a Snell SA 2000 or later rating, "M" or "SA" sticker, most commonly found under the interior lining inside the top of your helmet. Helmets currently being sold have an M or SA 2000 rating.



Under pressure: Next is tire pressure. Due to the nature of this kind of driving, you'll need to manage your air pressure. About 32-33 lbs. cold is a good starting point for my tires - Bridgestone Grand Touring Summer Turanza ER30 - 255/50Z/R16 - 92W. The average temperature range for a high performance radial street tire is 180-200 degrees ferenheit. Above that temperature, the tire lose grip and traction. Your tires will gain some pressure as they heat up. My tires gained a full seven pounds from pre-run cold to post-run heated teperature, and my tires are best at 40 psi hot, so I start with 33psi cold. I can now feel (in the form of car handling,) a simple 2 lb. change in tire pressure to any wheel.

Air: There is an air pump located up against the fence at the end of the Kendall garage. Add more air than you need to each tire and then move your car to make the adjustments.

Take your temperature: After each run, check your tires' pressure. If the pressure, and thus the temperature, of the front tires is equal to the rear, then the overall balance of the car is likely good. If the fronts are hotter, or of greater pressure than the rears, then the front tires are sliding more than the rear tires. A spring, shock, or antiroll bar adjustment may be required. The slip angle for street tires on dry pavement is 3 to 10 percent.

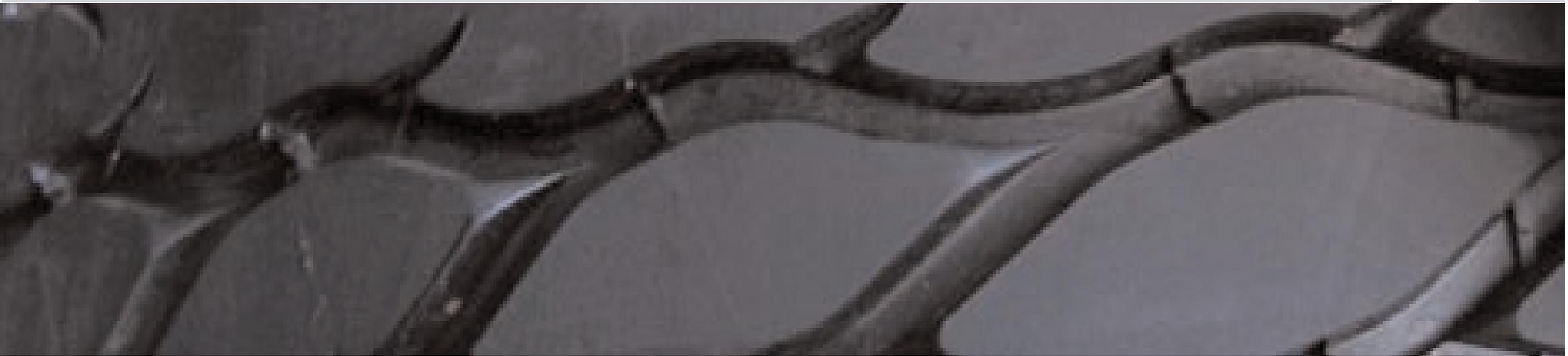
Speed ratings: A tire receives its speed rating by the U.S. Government through meeting minimum standards for reaching and sustaining a specified speed. In general, a higher speed rating will result in better car handling. **!** > It is best not to mix and match tires with different speed ratings on your vehicle. This could cause serious problems with the handling of your car on the track. Below is a list of speed ratings along with the corresponding speeds they represent.

H- Up to 130mph	Q- Up to 100mph	R- Up to 106mph
S- Up to 112mph	T- Up to 118mph	U- Up to 124mph
V- Up to 149mph	W- Up to 168mph	Y- Up to 186mph
Z- 149mph and over		

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Driving schools are officially "untimed events," so, stop watches or other timing devices are not allowed at the track.



Select advice from Phil Abrami's Tire Guide: Part 1 BMW CCA, Boston Chapter

Heat Cycles: “To heat cycle a new set of tires means to GRADUALLY bring the tires up to their recommended tread surface operating temperature (somewhere in the range of 160-230 degrees Fahrenheit with 180-200 the ideal) and to hold it there for, say, five to ten minutes (i.e., overall, the heat part of a heat-cycle is about the length of time of a single driving-school session) after which the wheels and tires are removed and stored for at least 24 hours. Heat cycling increases the life of a tire because it allows the chemical bonds within the compound to break-down when first heated and then to reform and align when subsequently cooled in such a way as to provide a consistency and strength that was not there before.”

“Common methods of heat-cycling include use during a single session of a driving school, repeated parking lot figure eights in both directions (make sure you get approval; ask me how I know!), or 100 miles of highway driving. The advantage of these methods is their cost. The disadvantage of the driving-school method is that you must have another set of wheels and tires for the remainder of the day. Both the driving school and parking lot methods may not heat cycle the tread surface equally. The highway driving method will probably provide sufficient flex for a decent, evenly distributed heat cycle but at the risk of cutting the soft tire surface.”

Tire Pressures and Suspension Tuning: “Cold tire pressures for DOT-R tires are generally in the range of 32-42 psi; a few pounds higher than your owner's manual recommends for regular street and highway use.”

“An old driving school trick for roughly estimating your tire's proper inflation is to use tire chalk or white shoe polish to mark the outside edge of the tread and sidewall of each tire before a track session. After the session examine each tire's markings.”

“Good pressure means all of the markings on the tread are gone but the sidewall markings are untouched. If the pressure is too high, marks will be visible on the outside edge of tread. If the pressure is too low, all the tread and some of the sidewall markings will be worn away. Make adjustments to the pressures in increments of no more than 2 psi per tire between track sessions and re-test. Typically, a change of 3 psi will mean a quarter inch change in the sidewall markings you've made.” Check the pressure and add or delete from that number. Do not use the original pressure setting. [Next >](#)



“Keep in mind that adjusting tire pressures is a small thing you might be tempted to take too far. On stock suspensions, there is not going to be sufficient negative camber to prevent a tire from rolling onto its sidewall under cornering. For example, on a track with primarily right-hand turns, the left front tire will tend to roll onto its sidewall no matter how high tire pressure is raised. So don't overinflate. This is where common sense and seat of the pants tuning become important too.”

“In the final analysis, you'll want tire pressures that will give your car a neutral feeling when cornering. Non-neutral steering means either understeer or oversteer. Understeer is the tendency of the car to continue in a straight line when you turn the steering wheel to corner. Oversteer is the tendency for the back-end of the car to want to break free when cornering. An experienced driver can detect understeer and oversteer by how light or greasy the front or rear of a car feels in a corner. The tendency to turn in early can be another sign of an understeering car while the tendency to turn in late can indicate an oversteering car.”

Tires In The Rain: “Competition tires with tread showing may be used in moist or damp conditions. They will probably be acceptable in a light drizzle. But when it RAINS, and especially when there is standing water, it is important that your track-tires have sufficient tread and are designed to prevent aquaplaning. For the rain, narrower is better; a narrow tire helps cut through the water and minimizes aquaplaning. Tire pressures should be changed too. To get better grip in the wet you'll want to raise pressures from dry settings by 4-8 psi.”

“When it is possible, you can also make suspension adjustments to account for inclement weather. Reducing negative camber, softening the suspension, and raising the ride-height to increase body roll and weight transfer all help in the wet. In other words, returning your car toward its stock configuration may very well make you quicker when runnin' in the rain.” - Phil Abrami [Next >](#)



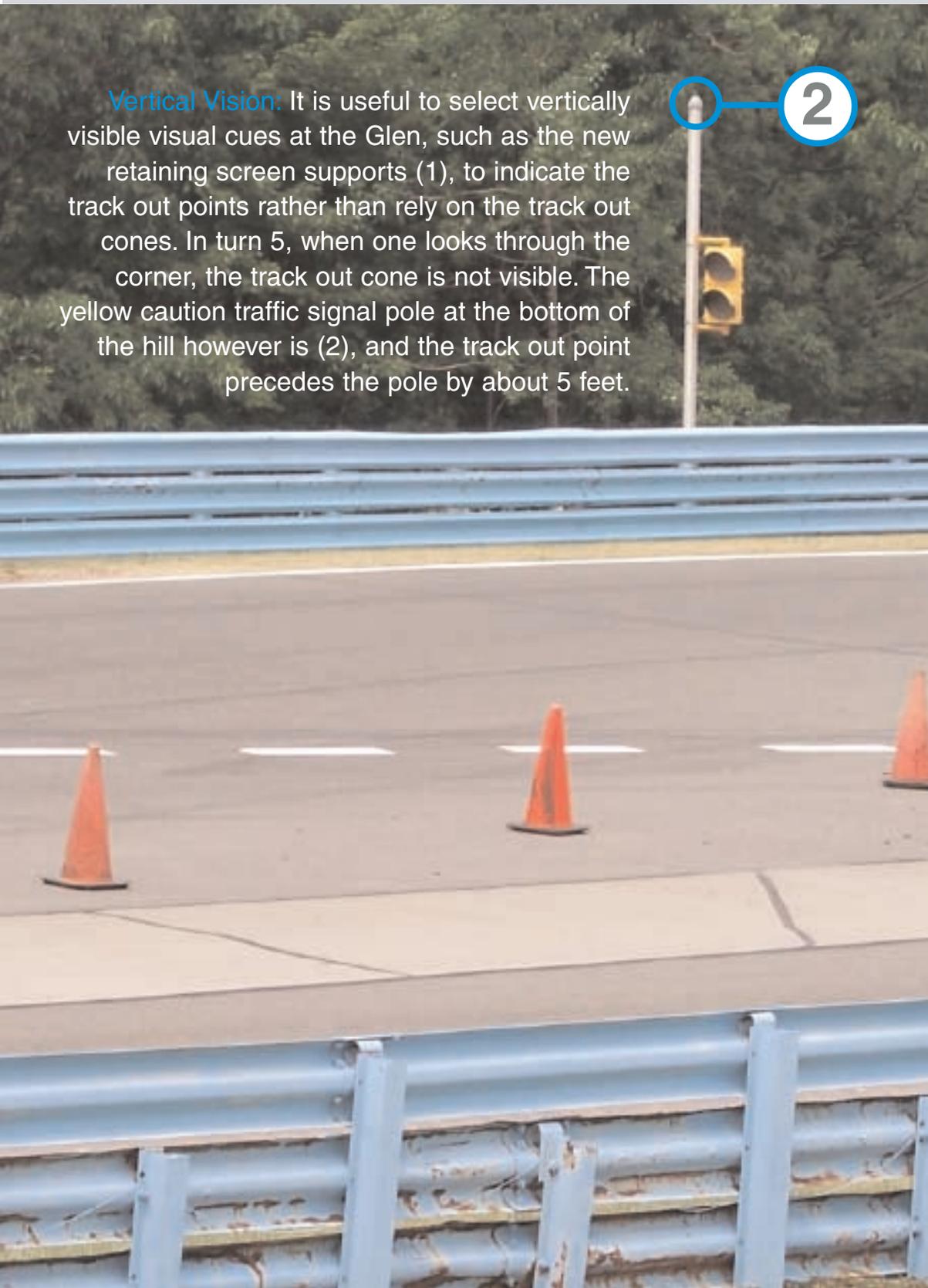
Cones at the corners: The primary means for establishing the line is the use of reference points. At Watkins Glen, there will be orange traffic cones marking the turn-in, apex and track-out points. These simplify your efforts somewhat because they show you roughly where the car should be placed, at different points through the corner. With (or without) these cones you must find ways to help yourself consistently place the car on the line. A reference point is simply anything that tells you when to turn-in, where to clip the apex and where to track-out. Whether your reference points are cones, cracks in the road, stripes on the curbing or chips in the pavement (and whether you should turn in at them or four feet beyond them) reference points must be determined by each individual driver and often with some creativity.

Vertical vision: I found it useful to select vertically visible visual cues at the Glen, such as the new retaining screen supports, to indicate the track out points rather than rely on the track out cones. Many of the corners at Watkins Glen lead to blind apexes or track out cones that are not apparent until you're well through the corner, and then, it's really too late. For example, exiting the "bus stop" and entering "the Loop" or turn 5, when one looks through the corner, the track out cone is not visible. The yellow caution traffic signal pole at the bottom of the hill however is, and the track out point for me precedes the pole by about 5 feet. You see the pole long before the cone, and you can see the pole through the whole corner, even in the rain. These non cone reference points don't move from one school to another. The cones placement very well might.

Historic placements: Additionally, some of the cones are not placed at the actual turn in points at all. The orange cone leading into the "chute" or turn 6, is placed at a location where two strips of pavement once joined. The cone's original placement was intended as a warning to drivers that a bump existed at the seams. The bump is now gone, but the cones placement remains as a tradition because drivers once used that bump as their reference point, and turned in after the seam. Turning in on that cone's placement now will cause an early apex, and an early apex is bad. [Next >](#)



Vertical Vision: It is useful to select vertically visible visual cues at the Glen, such as the new retaining screen supports (1), to indicate the track out points rather than rely on the track out cones. In turn 5, when one looks through the corner, the track out cone is not visible. The yellow caution traffic signal pole at the bottom of the hill however is (2), and the track out point precedes the pole by about 5 feet.

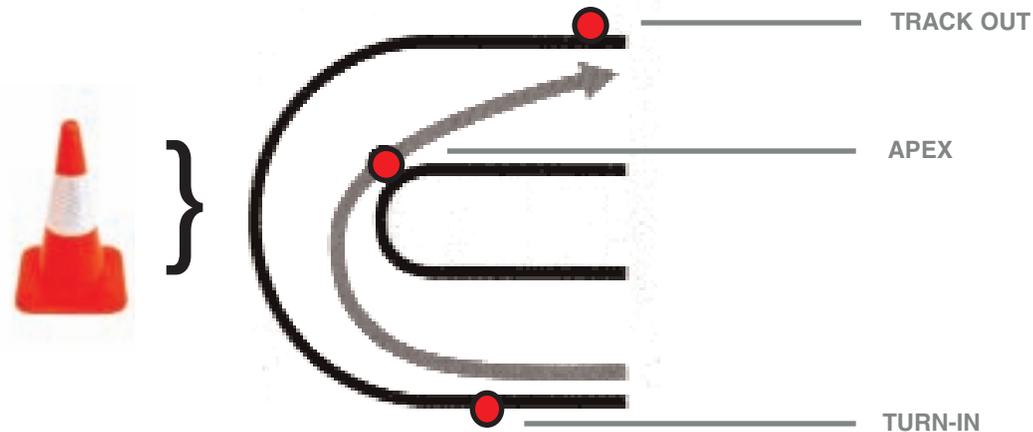




Cones: In turn 2, the start of the uphill section in the Esses had 5 cones at the inside corner at the May school. The apex at the time was the second to the last of the 5 cones, not the center cone.

As a general rule, if you are doing anything with the wheel after the apex of a corner, you are most likely on the wrong line. When you hit the apex at the proper point, the car will naturally want to unwind as you accelerate to the trackout point, and you should let it, using all of the track.

Note: Avoid less permanent reference points such as shadows or clumps of grass that may not survive getting run over.

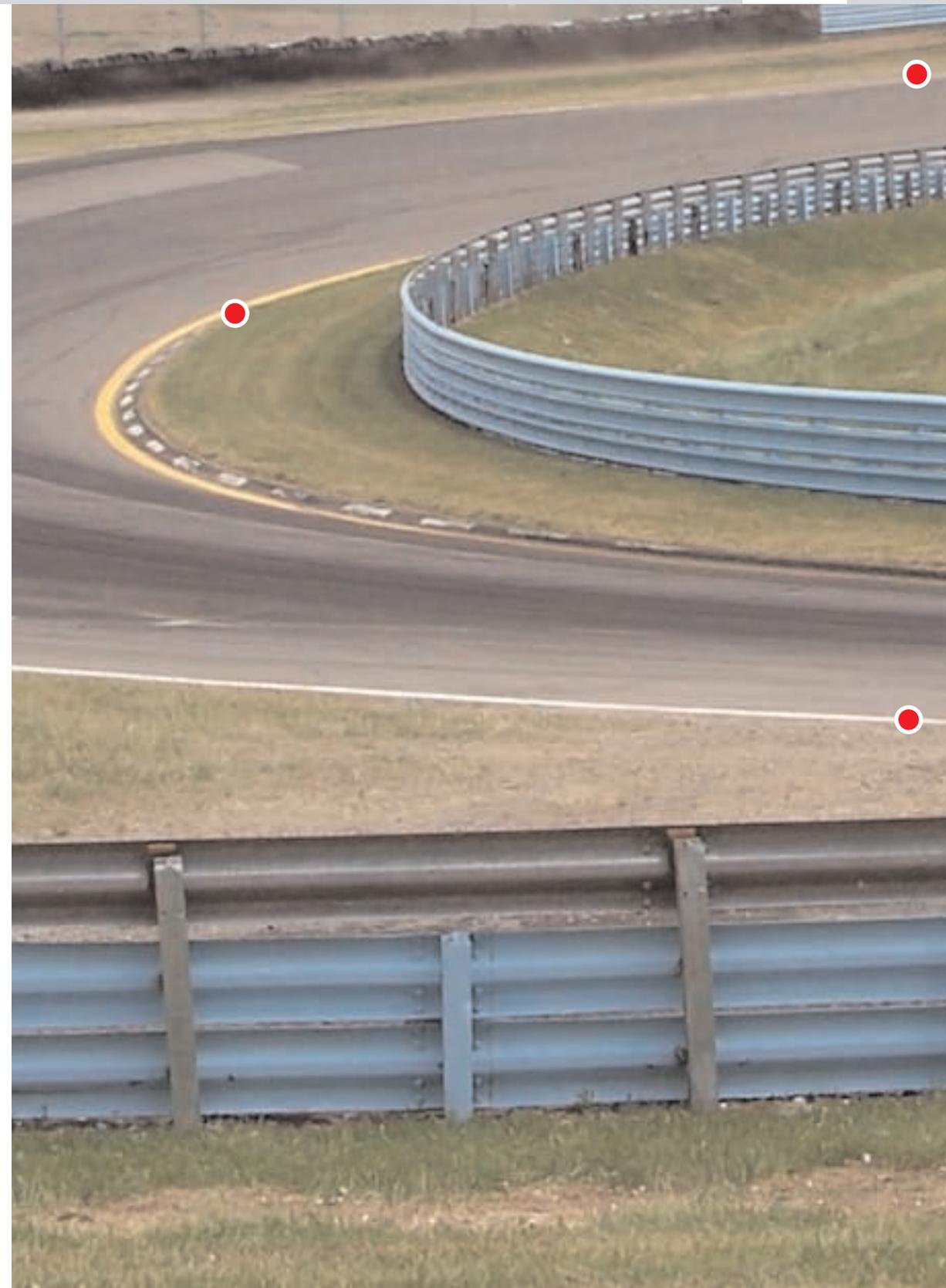


Anatomy of a corner: Shown above is a basic 90° right-hand corner and a late apex radius through it. There are three basic components to each corner, each usually marked with an orange cone.

Turn-In: The point where the steering wheel is turned heading into a corner.

Apex: The point where the driver "clips" the inside of the track.

Track-Out: The point where the steering wheel is again centered exiting the corner. [Next >](#)





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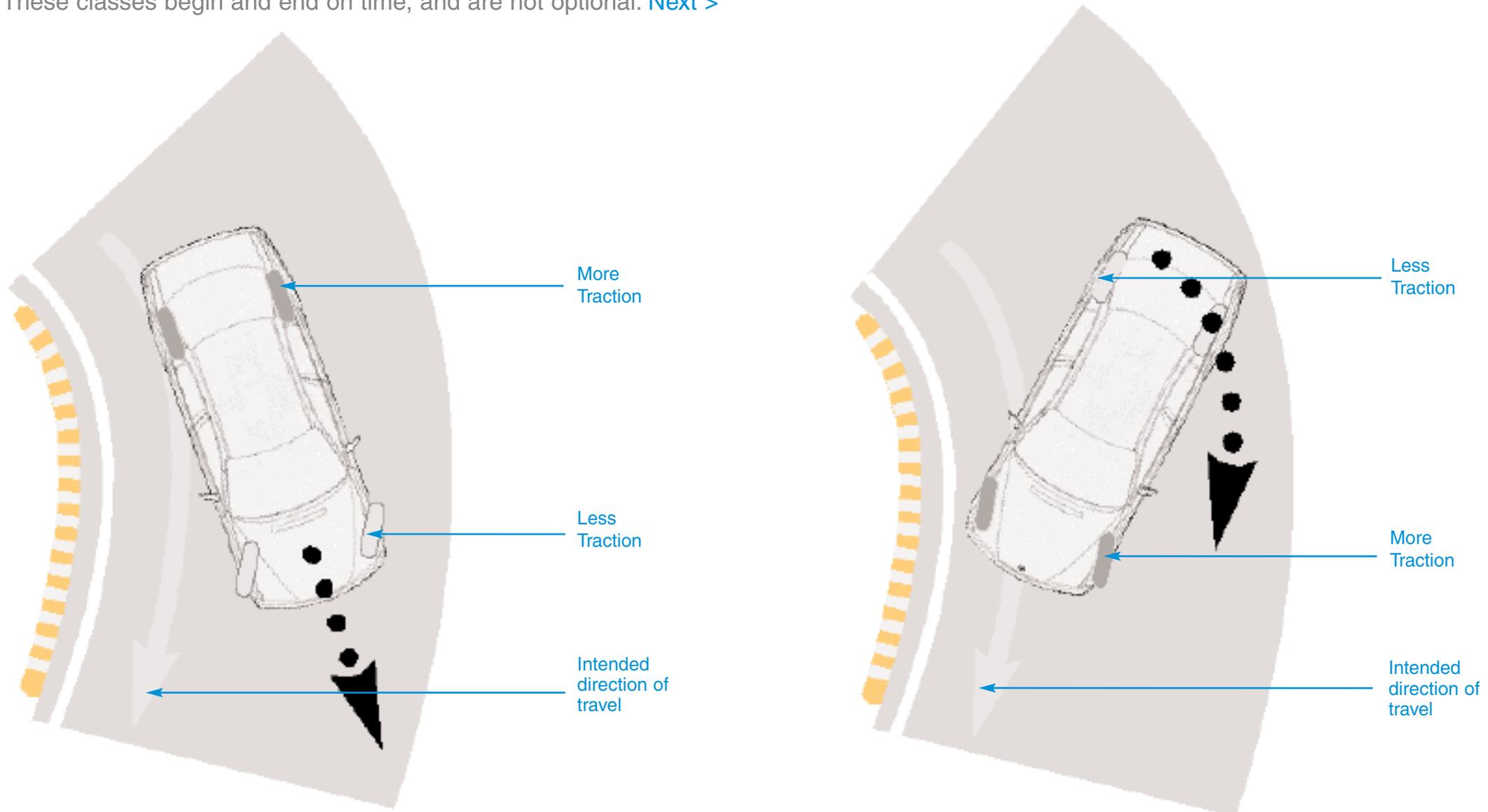
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5_A



Classroom sessions - learning to drive fast while sitting still: Between your run groups you will participate in some educational seat-time. The curriculum includes flags and their meaning, car physics, gravity circles, tire contact patches, slip angles, car weight shifts, over and understeer, and the mental aspects of performance driving among other subjects. The training is held in a small class-room at the front of the paddock. Your teacher will use an overhead projector, wall maps, and a sense of humor to keep things interesting. Even if you think you know a lot, you will likely learn something in each of these sessions. The information imparted is related to what session you're in through the day, so it's directly relevant and applicable to your next run. These classes begin and end on time, and are not optional. [Next >](#)



Understeer: The front tires have less traction than the rear tires, and regardless of the steering corrections, the car continues to “plow” or “push” straight ahead. The car does not steer as much as you want, so it is understeering. Understeering in effect, increases the radius of a turn.

Oversteer: The rear tires have less traction than the front tires, and the back end of the car begins to slide. The car has turned more than you want it to, so it has oversteered. This is also called “being loose,” or “fishtailing.”



Homework assignments, charades and the imaginary track: Our first day of “school” ended with a classroom session, and at the close of the class we were all given a home work assignment - “drive the course in your head tonight.” That evening after dinner, I overcame my own reluctance to play charades with myself, and sat in the chair of my hotel room, alone, feet on the floor, arms out, and drove the track. What I can attest to is the fact that my driving the following day improved as a result. Noticeably, and directly attributable to my little imaginary drive.

Your brain does not distinguish between fictitious and real occurrences, but rather accepts all as if they were real. This mental practice or visualization is effective for a number of reasons. First, it’s safe. Make a mistake and all you have to do is back up and attempt the corner you were driving again. You can drive in slow motion if you wish. Second, you can do it anywhere. Third, it’s free. While stop watches aren’t allowed on the track, an instructor commented that he drives Watkins Glen in his head with a watch in hand, and his times match those on the track within a second or two. His visualization is in real time, accurate and precise.

What I learned in my head was the solution to two back to back corners I had been working on throughout the previous track day that each required additional steering inputs on my part after the turn in point. Such additional steering inputs were the sign of an improper line - and I knew it. A line that I repeated for some reason through muscle memory. While visualizing the two corners, my error became clear, and I simply corrected it in my head. The following day on the track, at speed, I drove the new line that was now stored in my head...”brake point...here, downshift... turn in at this angle... here...this much...one steering input all the way through the corner...look through the corner as you accelerate... unwind the wheel to the trackout point...here...now further through the corner...pushed out on the track... higher RPMs out...shift into 4th earlier...wow...” O.K., that visualization thing actually works. Do the homework. [Next >](#)



On stage - gridding: Bring your car to the staging area and be ready to go 10 minutes before run time. 5 minutes before run time, fasten your seat belt, secure your helmet and warm up the engine to operating temperature. There are four lanes in the staging area at Watkins Glen, and generally, the cars are released to the track from drivers right, to left. If this is your first school, you may not want to stage yourself “on the pole,” in the far right lane, as your first order of business will be to issue a dozen point by’s for the faster cars behind you. Select your staging lane based on your driving ability and comfort. Wait for your instructor to get into your car. If for some reason, your instructor does not show up, stay in the car and raise your hand out the window. This will alert other drivers to go around you – and also alert the staff who will find your instructor. [Next >](#)

Tip: The most important corners are those that lead to a straightaway. At the Glen that’s turn 1 (the ninety,) the Toe of the Boot (turn 7,) and turn 11 (oddly, the only turn of all 11 whose name is still assigned a number.) The second most important turn is one that comes at the end of a straight with very little straight after the turn. Again, in the case of Watkins Glen, that would be the end of the back straight entering the “bus stop” or “inner loop,” and maybe the heel of the boot, (turn 8.)





Passing and point bys: Through controlled practices, the GVC BMW CCA has virtually eliminated incidents caused by passing during driving schools. This requires, however, a great deal of awareness and cooperation among drivers.

At Watkins Glen, the GVC BMW CCA passing zones are restricted to the front straight, between turns 1 and 2, on the back straight, on the “instep of the boot” (going into the toe), coming up out of the “toe of the boot,” and between turns 9 and 10, with the slower car staying ONLINE. (You will be provided with a map of these zones in your welcome packet)

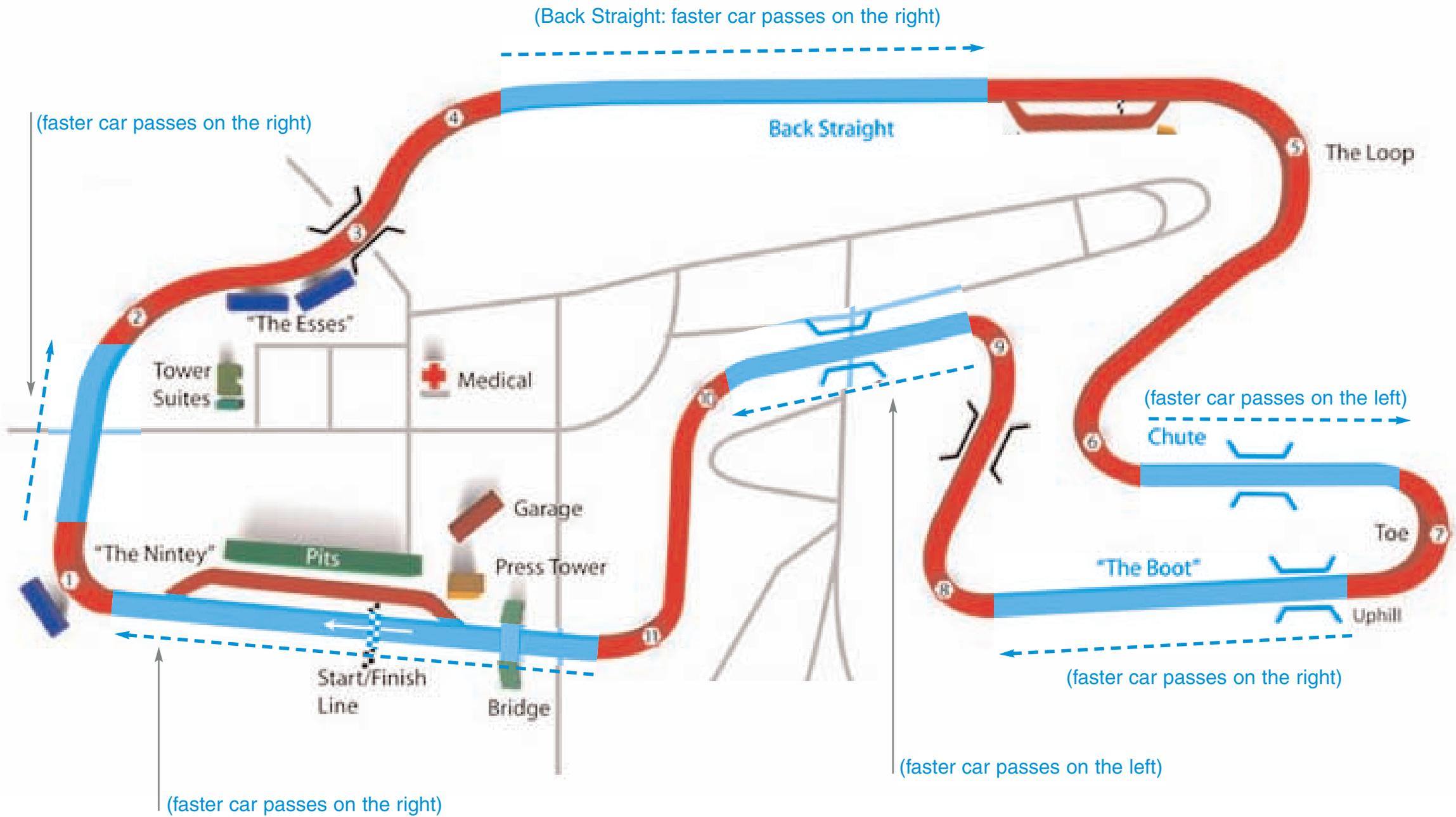
It is within these zones that a pass must be both initiated and completed. To accommodate this, the driver being over-taken should visibly point to the side on which he or she wishes to be passed. This is why you will drive with your windows open, rain or shine. The hand gesture is called a “Point-By.” Generally, the car being passed maintains its position on the line, while slowing slightly if necessary to facilitate the pass. The car over-taking must wait to be pointed by before maneuvering around the slower car, and must also determine before pulling along side whether there is adequate space to complete the pass within the passing zone. Point bys should be concise and clear in their direction and intent. Do not get creative or add your own personal style to these gestures. Their purpose is to clearly communicate intent, and that clear communication is what prevents each of us from trading paint with each other on the track.

A point-by does not necessarily mean that a pass is advisable. Mirrors are crucial; each driver should know prior to reaching a passing zone that there is a faster car behind. Anticipating a pass will allow the slower car to point early and temper acceleration, giving the over-taking car more time to pass safely.

You are not racing for position during a track session. A faster car behind will serve only to break one’s concentration, while a faster car in front may provide, if briefly, visible clues as to exactly why that car is faster. Be liberal with your point-bys. [Next >](#)



Passing zones at Watkins Glen: Marked in blue, all groups may pass in the following zones. The slower car stays on-line. [Next >](#)





Note: If a faster car is at the back of a line of slower cars, it is often advisable for the quicker vehicle to make a slow run through the pits. This will give the faster driver the opportunity to return to the track with perhaps less traffic, and allow the slower cars time to sort out.

Pit-in signal: There is the possibility that a driver will be entering the pits in front of a car that is continuing at high speed. If the car following is unaware of the exaggerated closing speed an incident can easily occur. To prevent this, the driver slowing down starts giving the pit-in signal before slowing for the pits, and continues giving the signal until actually entering the pits. The signal is simply a fist in the air out the driver's side window, and generally occurs in or around turns 10, (the fast left) and the short straight leading towards turn 11. The "pit-in" signal is also given and maintained if the driver is required to slow anywhere on the track, and for any reason.



Communications with instructors: You and your instructor will be able to talk to each other throughout the course of a run with the aid of a communicator. This device consists of a microphone that is placed in front of your mouth, and an earpiece that slips between your outer ear and your helmet lining. A flexible cord will connect you both. The system has volume adjustments, and is activated only when you speak, or when you breath really hard going into a corner. To remove the communicator from your helmet, pull on the microphone, and not the wiring. [Next >](#)





How to sit down: It may seem elementary to discuss how to sit in a car. After all you've been doing it for many years, but, for this type of driving, seating and body position is important, and very likely different than your daily driving. To control the car you must be able to concentrate on inputs - steering, throttle and brakes - without worrying about being a loose object behind the wheel.

You should be sitting IN rather than ON the seat. The driver's body has only three points of contact with the car: the seat, the steering wheel, and the pedals. You will receive much of the feedback from the car through the seat.

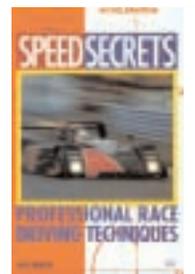
Use your feet to push back and wiggle your butt into the seat. After making sure you're in total contact with the seat, see if you can reach all the pedals. If not, adjust the seat and start again. Your wrist, with a slightly bent elbow, should sit at the 12:00 location on the steering wheel.

Next up is hand position on the steering wheel. Place your hands at either 9:00 and 3:00 or 10:00 and 2:00. You'll get better results if your arms are slightly bent. If they're fully extended you won't get good leverage.

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Speed Reading:

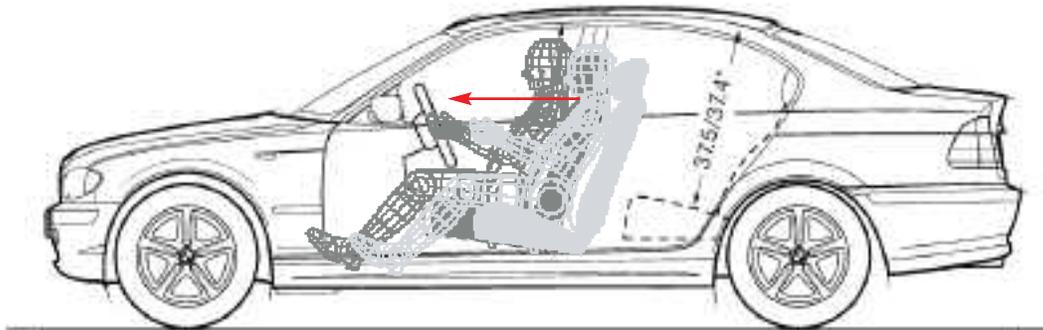
If you get a chance, get a copy of "Speed Secrets" by Ross Bentley. It's a great book explaining the how and why of the racing line, braking, accelerating, and is an entertaining read. He has a second book out, Speed Secrets 2, which is a little more advanced, but still applicable. I have read both, and found them helpful. You can get a copy from amazon.





Next move your right hand and again place it at "noon" on the wheel. If you can do this without moving your back away from the seat you're probably positioned correctly. To make sure, put your hands back at 9:00 and 3:00 and turn the wheel to the right and left WITHOUT changing position on the wheel. If your elbows hit the seat back or your body, you're too close to the wheel. Tilt the seat back slightly until your arms are slightly bent.

Generally speaking, you will be sitting much closer to the wheel than in your daily commute. At first, this will seem odd. To overcome the "oddity" of the change in position, I have simply left my seat in the track position for my daily driving.



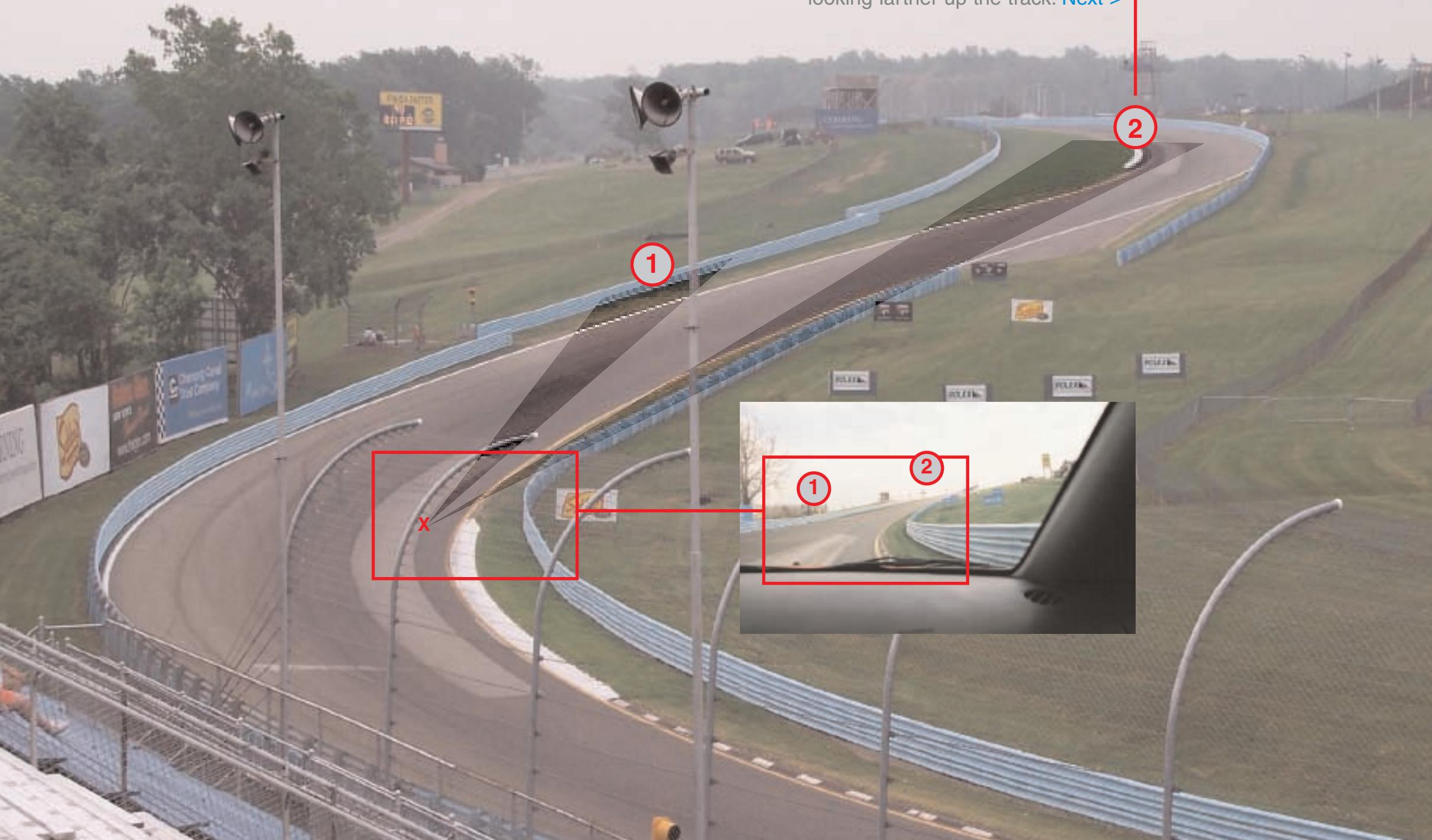
Feet: !> Your right foot should always be on the throttle, even if it's a light steady pressure, or on the brakes. Don't waste time between the two, and you should never be coasting.

Your left foot should be on the dead pedal, or the clutch, and not hovering above either. You will come to rely on your left foot to support your body, holding you in position as you fend off cornering forces. On the Sunday after a full Saturday of driving on the track, my upper thighs felt similar to the day after a full day of skiing. [Next >](#)





The car goes where you look. As you pass the apex, your eyes should have already found the track-out point, looking well through the corner. In the illustration below, your eyes should look up through the Esses to point 2, rather than simply through the corner to point 1. Events seem to happen much more slowly when the eyes are looking farther up the track. [Next >](#)





It doesn't matter where I am, it matters where I'm going. Where I am was determined by what I did a long time ago" Ross Bentley

Ross Bentley

Eyes: The idea that you use your eyes to find the line seems, of course, rather obvious. You will find, however, that the way you've grown accustomed to using them while driving around town is often less than adequate for the track. Most new drivers will focus their vision relatively near the front of the car. As the car approaches the turn-in point the new driver will be looking at that reference point until the car is nearly abreast of it. As the steering wheel is turned, the driver then begins looking for the apex. The basic rule to apply here is a simple one: Our eyes tell our hands what to do. If you turn toward the apex before you find it with your eyes, the movement of your hands will be both inaccurate and inconsistent. When done properly, your eyes will be focused on the apex before you actually turn in. The turn-in point is seen only in your peripheral vision, and you'll learn through experience how to turn in at the proper point without looking directly at the turn in cone. There is however, the tendency of drivers to look through the corner to the apex before turning in and start to drift towards the apex early. Because the car goes where you look, be mindful that your turn in doesn't start as a fade, setting you up for an early apex. As you pass the apex, your eyes should have already found the track-out point, looking well through the corner.

Using your eyes in this manner also allows you to create a sight-picture of the corner, where instead of seeing the small area surrounding a single cone you instead have the majority of the corner, often including all three cones, as your sight-picture. Events seem to happen much more slowly when the eyes are looking farther up the track. Your car will go where you look, so if you want to avoid an object on the track, don't look at the object, look at the line you should drive to avoid the object. [Next >](#)





Create a sight-picture of the corner, where instead of seeing the small area surrounding a single cone you instead have the majority of the corner, often including all three cones, as your sight-line. [NEXT >](#)

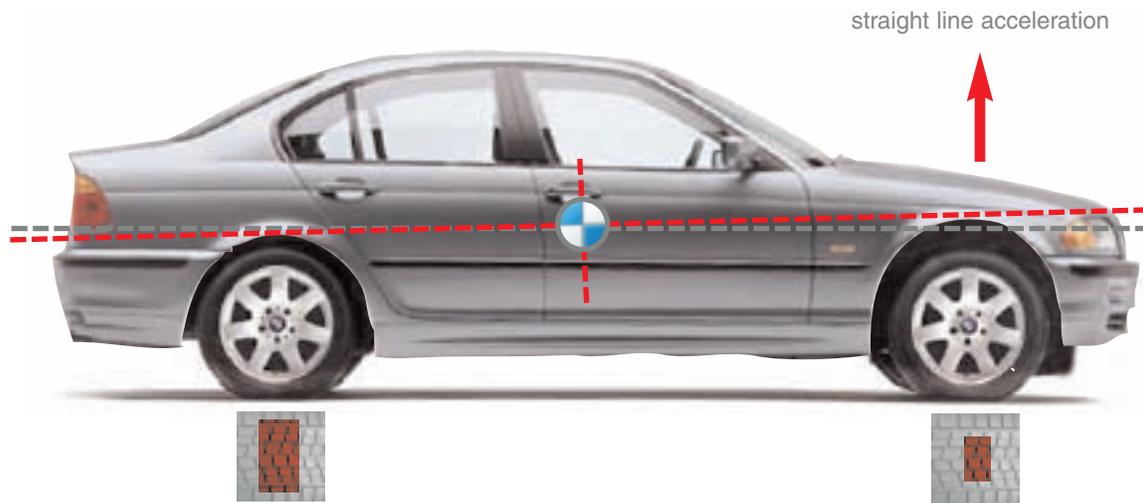


Mirrors: Before attaching the seat belt, check the mirrors. When you are on the track (and of course for everyday street driving) it is your responsibility to check the mirrors. You will be in the beginning or novice run group and there will likely be students who have attended other drivers schools. As a result, they will likely be faster, so be aware of what is behind you. With that in mind, your first priority is still to concentrate on the line in the turns. The mirrors are for the straightaways when you'll be passing or being passed. Try not to let the mirror affect your line in the turn, but check them. Get in the habit of looking behind you at specific points on the track, and do it every time you hit that point.

The rear-view mirror should be adjusted to center the rear window in your view. **!** > The side-view mirrors, contrary to common practice, are best adjusted to a point beyond where the side of the car can be seen. With adequate mirrors and proper adjustment a driver can often have a 360° view, eliminating completely the "blind spot." The image of a car moving from behind to the side will pass from the rear-view mirror to the side-view mirror. As the image leaves the sideview mirror the front of the car will begin to appear in your peripheral vision. [Next >](#)

13:13

If you have an accident (impact), you are placed on probation for the next 13 months. If you have another accident within this probationary period, you will be banned from any future GVC drivers' schools for an additional 13 months. This is known as the 13:13 rule.

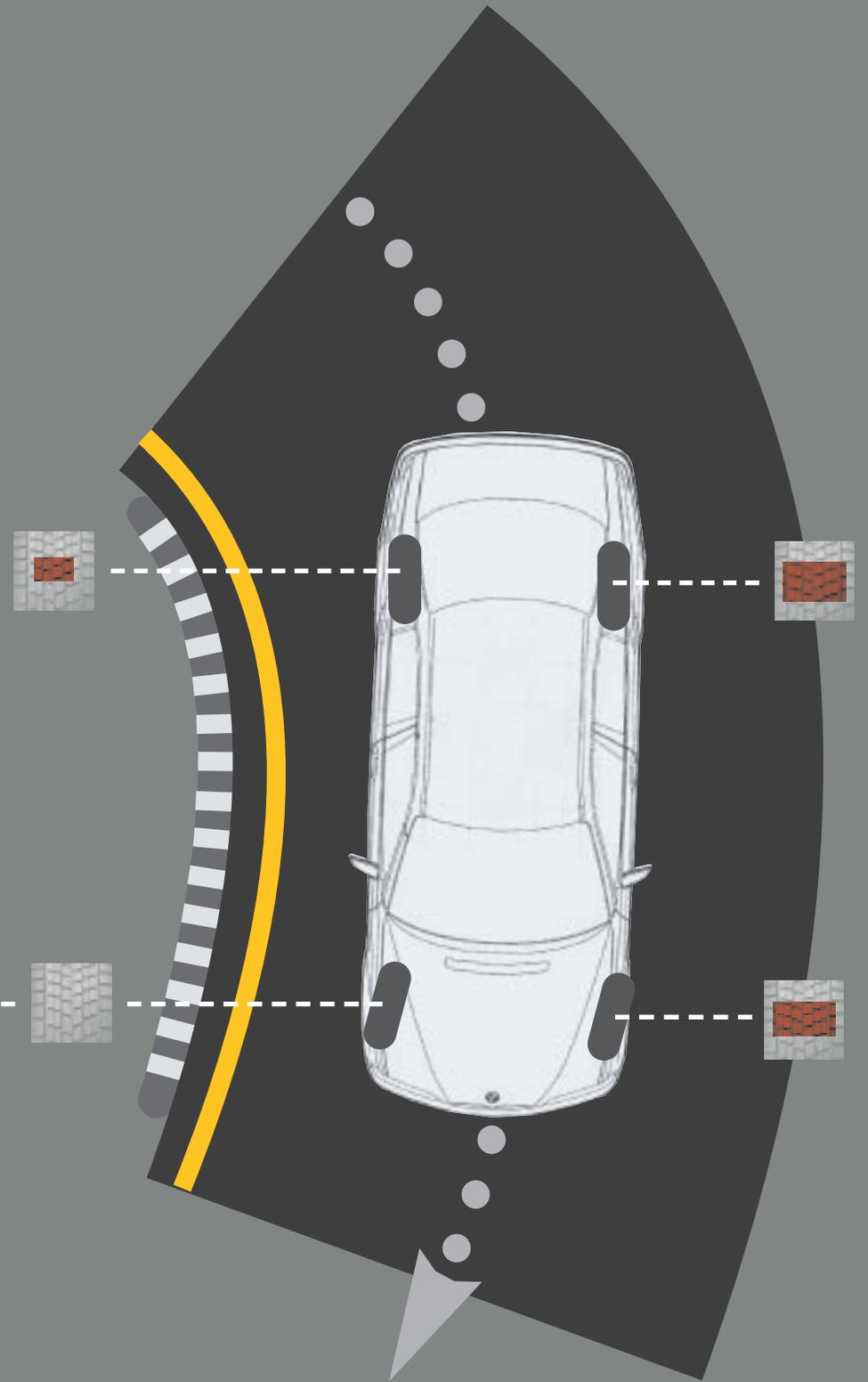


Weight Distribution: Much of your time on the track will be spent managing the cars weight, or better stated, intentionally shifting the weight in a controlled and smooth manner to the location where it will do the most good. You are connected to the track by your tire's contact patch, an area not much larger than the palm of your hand, or the ball of your foot.

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There is virtually no tire contact patch on your front right tire running through turn 7, or the "Toe of the boot." At times, I have seen front right tires in this corner - off the ground.

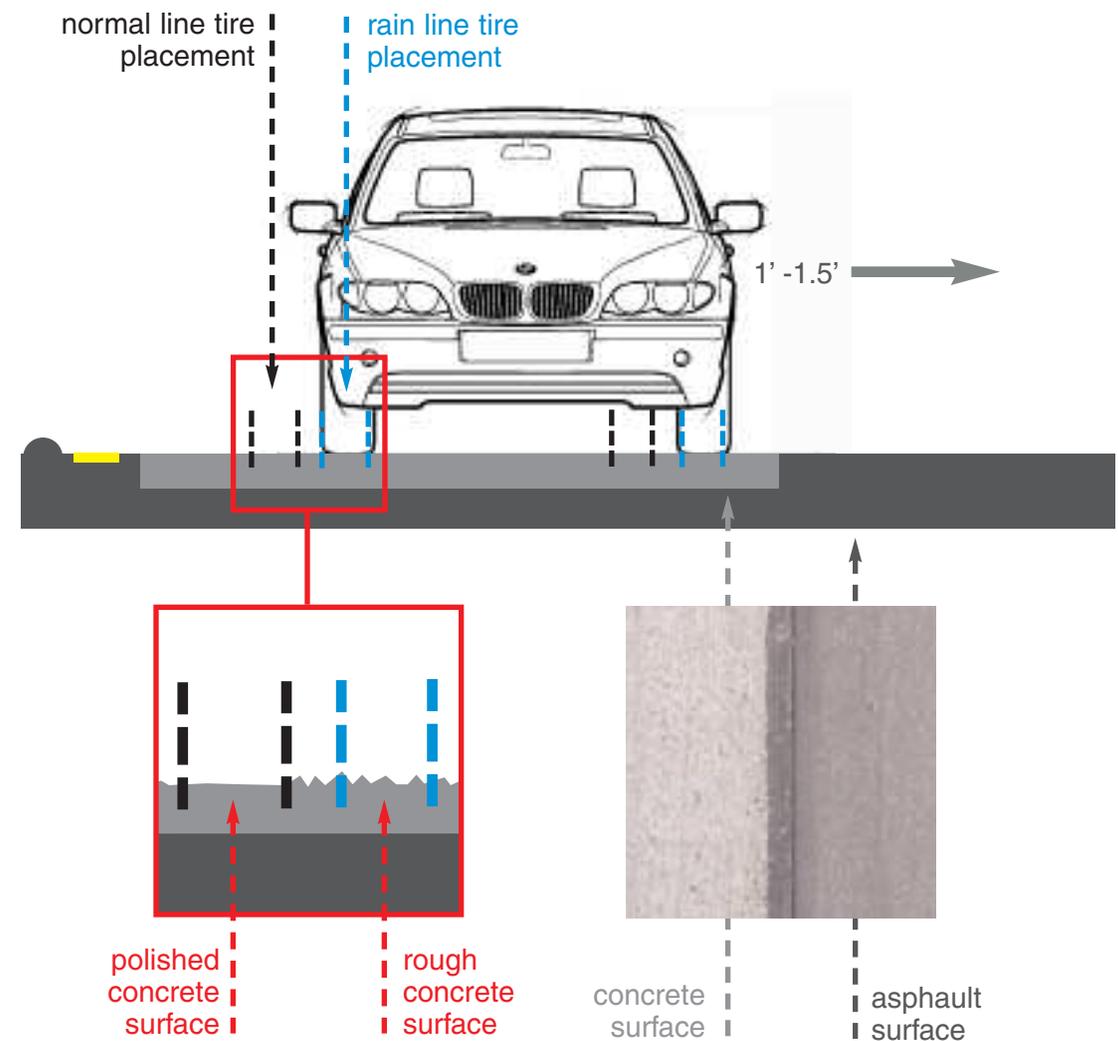


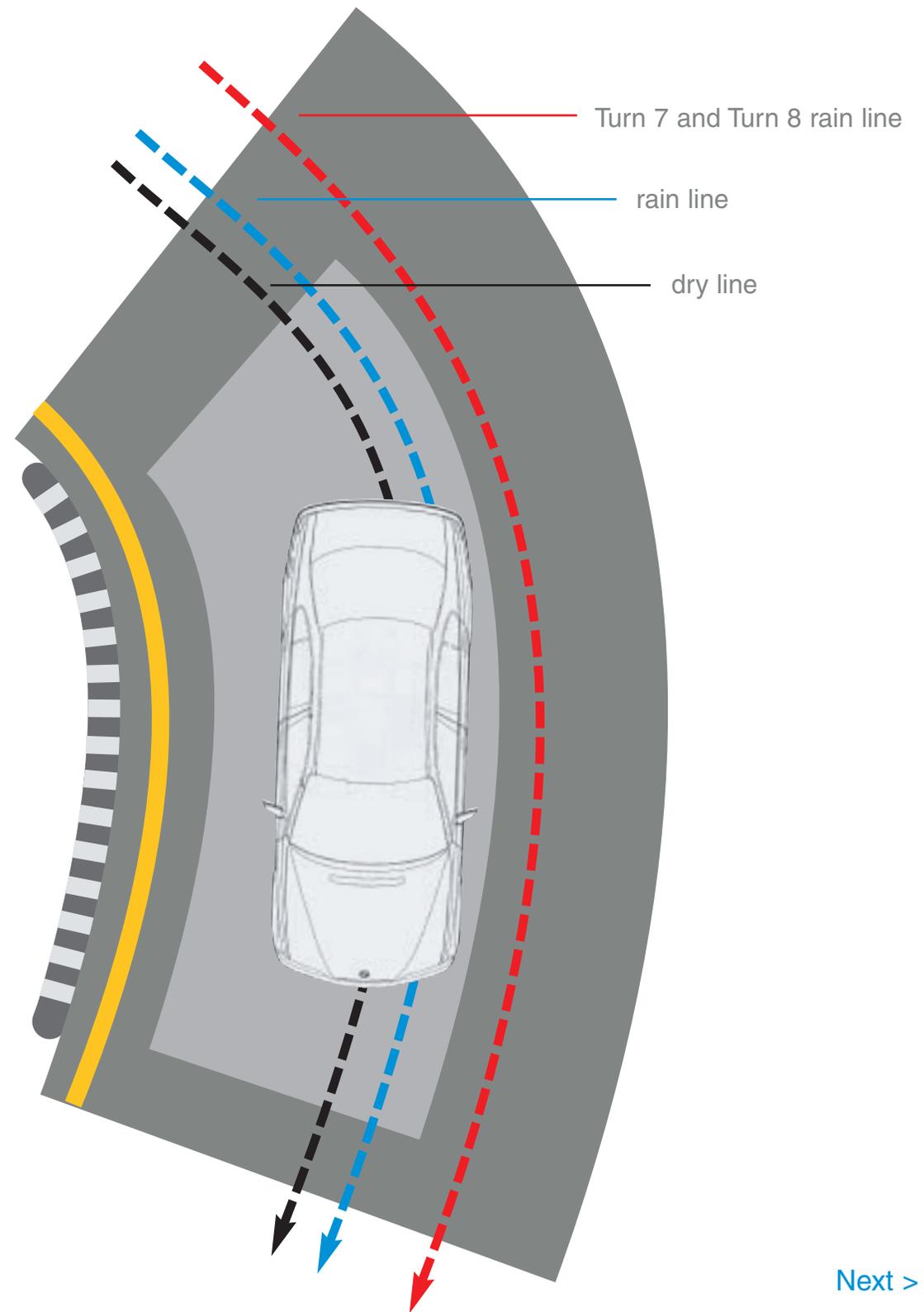
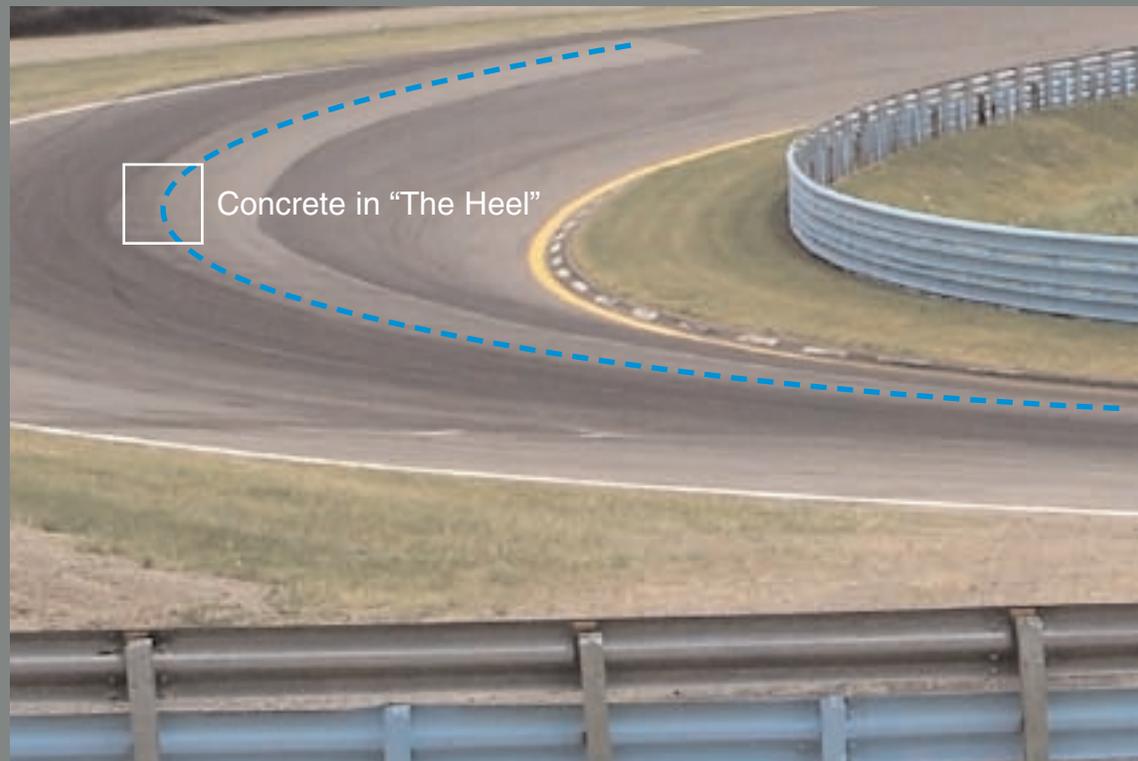
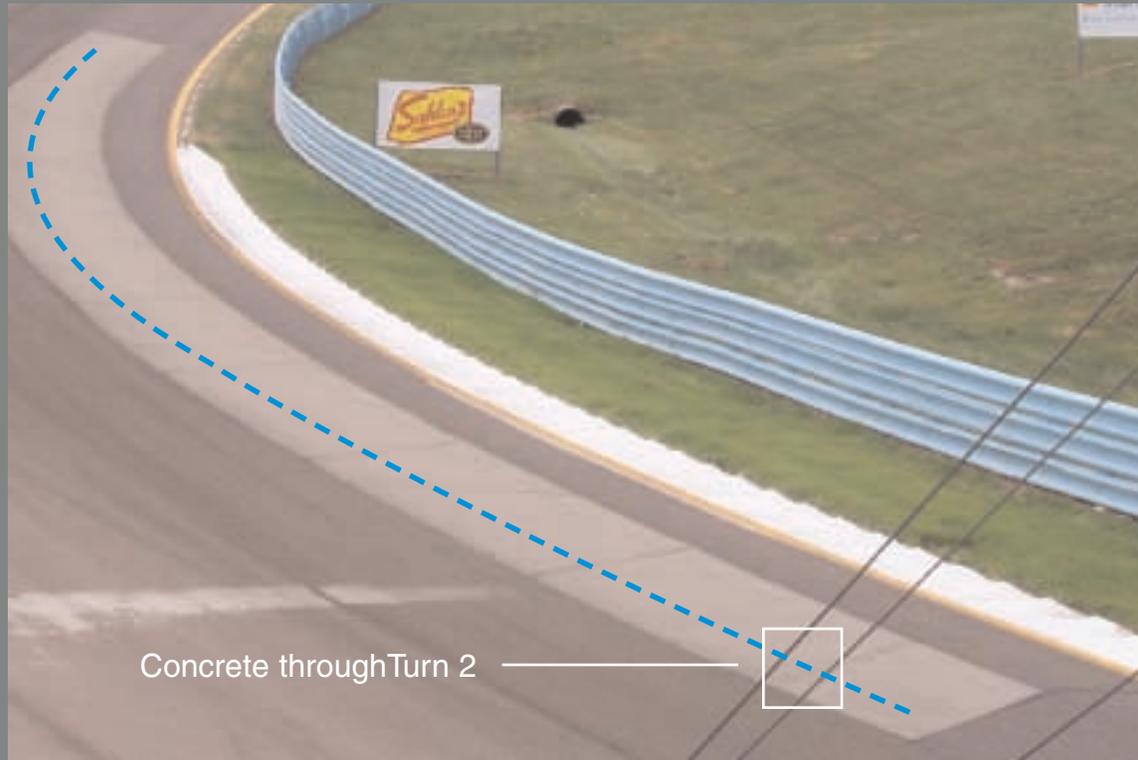


[Running in the rain - an editorial:](#) Long before my first driving school, I had a conversation about driving in the rain with an instructor. He commented that there were drivers that liked the rain, and those that hated it, and suggested that with a 200HP 323i, I should learn to embrace it. The rain as it turns out, is the great equalizer of cars on the track. A 500HP engine does little good in a rain soaked corner, and torque goes from an ally to an enemy. The top end power simply can't be applied. The first day of the August/September school took place in the remnants of hurricane Katrina. Driving rain, and driving cars. Windshield wipers on full. Small rivers across the track. Standing water and standing debris flags at the corner workers station's. Thankfully, I had arrived with the mental model that the rain was my friend, and I looked forward to the drive instead of dreading it. The course is completely different, as is the line. It's a new track. If you had a race line, and there's pools of water at the apex, you'll have to find a new path where there's traction, and I liked figuring all this out. This is not the time to experiment with finding the limits of your car, but you can still run quick relative to other cars if you find the right place to put your car on the track. Everything is amplified, understeer, oversteer, and tire slip. It's about being ultra smooth and driving with finesse in the rain, and oddly enough, it's sorta' the same when it's not raining. I like the forced practice. The weather forecast at the August school called for one day of steady rain, followed by a beautiful sunny day at the Glen. I saw the instructor at the track that weekend who had given me the advice on "loving the rain" months earlier. He had his car set up to run in the wet, and drove every session he could the day it rained. He only ran once on the following sunny day. How much do you love the rain? [Next >](#)



Running in the rain: Generally, you will want to mentally narrow the track by a foot and a half to ensure your weight loaded tire travels off the smooth traditional line and finds traction where the pavement or concrete is rougher. This is particularly true on the concrete surfaces found in Turn 1, the Esses, the “Bus Stop,” Turn 5, Turn 10, and Turn 11. Additionally, many drivers run a gear higher than “normal” to remove some of the car’s torque. While smooth is traditionally fast, in the rain, smooth is safe. No steering or throttle input should be abrupt. Your line will ultimately be determined by where on the track you can find traction, and that will vary by corner or straight throughout the day. Top speeds are radically reduced. Cars start to hydroplane at 80MPH. [Next >](#)





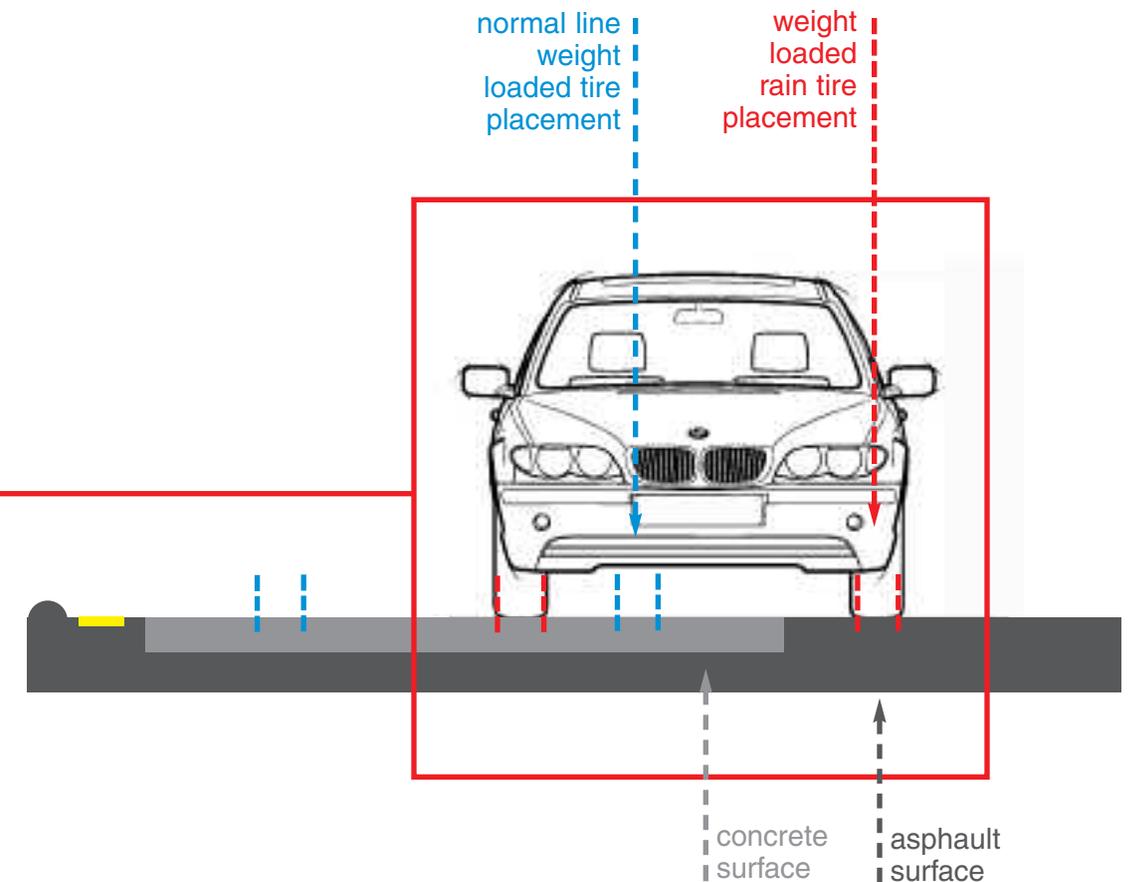


Concrete in "The Ninety", Turn 1 (Looking Back)



Running in the rain: There are several corners where moving off-line by a foot or two won't help you find traction at all. The entire concrete surfaces in turn 7 (the Toe,) and turn 8 (the Heel,) were polished smooth after they were originally poured, and those surfaces should be avoided with your weight loaded tire alltogether. At left, the Porche pictured in "The Toe" is starting it's trackout, but the driver's left weight loaded wheel never made contact with the shiny concrete track surface at any point through the corner. In general, all corners are taken with a late apex in the rain.

Debris washes to the apex, and oil rises to the surface when it is raining. Cross running or standing water with your wheels straight, if only for a second. [Next >](#)





[Next >](#)





Brakes: While not required for a driving school or track day, it was recommended by a few veteran drivers that I upgrade my brake pads and brake fluid. I selected Hawk HP Plus Sport/Track disc brake pads that are designed for sports cars, coupes and sedans for sport driving in autocross, Solo II and “track day” applications. The Hawk Performance HP Plus Ferro-Carbon compound can take the heat at the track and get you home safely without having to change your brake pads in and out. Additionally, some BMW models (the E46 for example) have a front brake ducting system that comes from the factory sealed off. There is a small plate inside the front wheel wells that may be removed to open up the air flow.

Watkins Glen notoriously and aggressively wears street brake pads, and the heat generated can often lead to brake fade. Typically, there are two reasons for the brakes to fade, both having to do with overheating.

The first and most common is when the brakes get so hot from the repeated use that the brake fluid begins to boil. As it boils, air bubbles are created. Unfortunately, air is much easier to compress than brake fluid, so your brakes become soft and spongy, sometimes to the point that the pedal travels all the way to the floor without applying much pressure to the brake pads.

The second reason for brake fade has to do with the overheating of the pads themselves. In this case, the temperature of the pads has risen to a point beyond their designed operating range. When that happens, a gas is actually boiled out of the pad material, but it doesn't just float away. It forms a layer between the pad and brake rotor surface, acting almost like a lubricant. With this situation, the brake pedal stays nice and firm and no matter how hard you apply the brakes, the car just doesn't slow down.

Neither of these scenarios are good. [Next >](#)





The “pluses” and “minuses” of Hawk HP plus - a review:

- / **minuses:** Due to the dramatic friction levels produced by this product to achieve "race-level" braking, rotor wear, noise, dust, and pad life are affected. My car squeals under light street braking “like a stuck pig.” My 323i often sounds like a city bus, and has been known to scare small children in enclosed parking garages.

+ / **pluses:** The high friction level of Hawk HP Plus pads are more responsive than most standard original brakes and their high resistance to brake fade makes them a superb upgrade for high performance street cars used in competition, for high speed driving or that encounter repetitive heavy braking.

Hawk HT10s

After 7 or so track weekends, it became apparent that I was exceeding the 800 degree operational range of the Hawk HP plus pads, depositing pad material on the rotors. I switched all pads to HT10s, with an operational range up to 1600 degrees. Brake pads are of course wear items, and as such, should be inspected regularly and replaced as necessary. Pads should be replaced when approximately 1/8th inch of friction material remains on the steel backing plate. [Next >](#)

< [The PFC ventilated disc and 4-piston caliper set-up of Joey Hand's Team PTG M3, photographed at a padock tour with the GVC BMW CCA during the Rolex Series “6 Hours of the Glen” race in April, 05.](#)



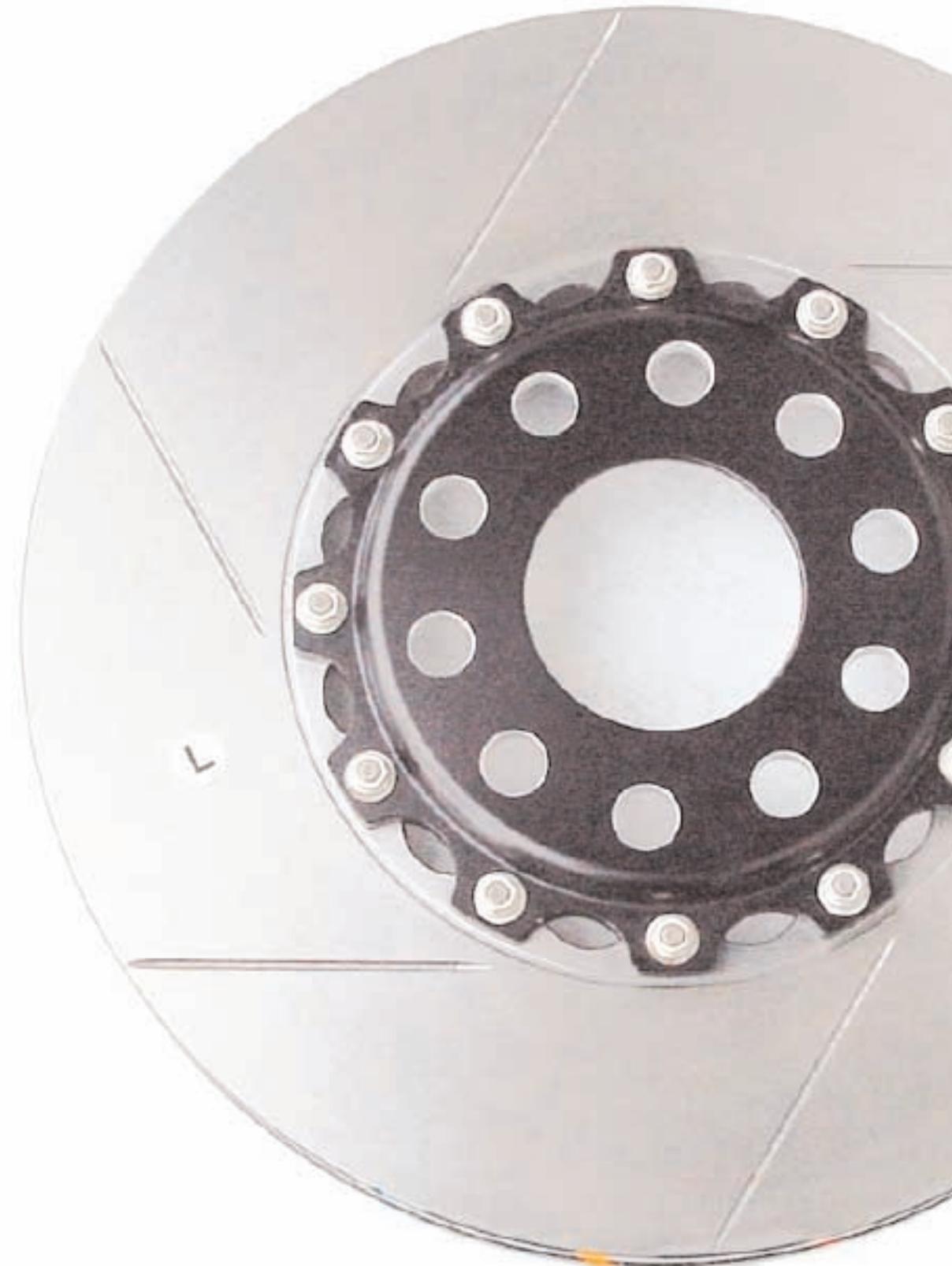
Brake bedding: After installing any new rotors or pads, it is imperative that you “bed” the pads into the rotors. This is a relatively easy process, but most do it wrong or never at all. Follow these steps to bed your pads:

1. Find an area where you have plenty of room and very little traffic.
2. Bring the car up to 60 mph and use normal braking to slow to 5-10 mph. Do not stop. Repeat 3-5 times. This brings the brakes up to operating temperature.
3. Bring the car up to 60 mph and stop as HARD as possible without locking up the wheels or engaging ABS. DO NOT COME TO A STOP. Repeat 3-6 times. This burns off the protective layer on the pads and rotors and leaves a layer of pad friction material on the rotors. You may smell the hot brakes, this is perfectly normal and expected.
4. Drive the car normally for 10-15 minutes without touching the brakes. Do NOT stop. This is the cooling down period. If you stop, you may leave an imprint of the hot pad on the rotor and this will cause a vibration like a warped rotor.
5. If done correctly, your rotors should have a cool gray/blue color from the heat cycle. If you need to, let the brakes completely cool and repeat the process. You can also do this bedding procedure at any time in the future if your pads need it or you want to restore good braking power. You're done.

NOTE: Are you using upgraded aftermarket pads/rotors/calipers, and want more initial bite in your braking? If you can do it safely and legally, you can wait for the brakes to cool completely from the procedure above and then repeat it, but in step 3, do it 3 times from 100mph instead. Leave a little more time to let them cool in step 4. [Next >](#)



Show v. Go: Many drivers caution against the use of cross drilled rotors, opting instead for slotted. A drilled rotor, while looking slick on the street, can crack at the drill points under heavy heat and continuous wear.





Oddly, one's ability to go fast is directly related to one's ability to stop fast.

Brake Fluid Primer: An additional modification made to the car's braking system by many first time drivers is the brake fluid itself. When investigating the different products available, you will likely come across several new terms and ratings, such as "wet and dry boiling points." As follows is a short primer on fluid types, and which one pertains to your application at any given time.

Brake fluid is "hygroscopic," meaning it absorbs water. When fresh from the can, it can be considered "dry" with the higher boiling point. That's why racers and people doing driver's schools change the brake fluid just before events. Over time, brake fluid absorbs water lowering its boiling point to the "wet" level.

For street cars, wet boiling point numbers are more important than dry because the fluid stays in the for quite a while (usually one to two years). After a few months, with exposure to humid air, the brake fluid performance is probably closer to the wet than dry point.

Brake Fluid Recommendations:

1. Normal Street Driving - Castrol LMA (Low Moisture Absorption), DOT 4, 446F dry and 311F wet boiling points, about \$5 per quart, changed every year or two.

2. Driver's schools (brakes at very high temp) - ATE Super Blue, DOT 4 spec, 536F dry and 392F wet boiling points, about \$11 per quart, changed before every driver's school if it's more than a three months old. One of the items checked at your pre-track tech inspection is the color of your brake fluid. Dirty fluid will not pass the inspection.

It takes about a quart to flush the system. [Next >](#)



Super Blue: Racers frequently will alternate fluid flushes using both the SuperBlue and TYP 200 (Amber). The identical specifications of the fluid and difference in color makes it easy to know when you have completely flushed old fluid out of the system



Maintenance - changing old brake fluid removes the absorbed water from the brake system. Water compresses at a different rate than the dry brake fluid, so squeezing the brakes on going into turn 1 with old fluid can feel a little squishy. Old brake fluid must be flushed out or water absorbed by the fluid eventually causes internal rust on the disk calipers and pistons.

Performance - changing old brake fluid helps high temperature operation because fresh (dry) brake fluid has a higher boiling point than older (wet) brake fluid. If brake fluid boils, compressible gas bubbles form, resulting in the loss of breaking capabilities.

DOT Brake Fluid Specs:

	DOT 3	DOT 4	DOT 5
Dry Boiling Point	401F	446F	500F
Wet Boiling Point	284F	311F	356F

The DOT 3 and DOT 4 specifications are for glycol based (regular) brake fluid, while DOT 5 is for silicone. Silicone DOT 5 is not compatible with the ABS hydraulic control unit because it doesn't lubricate the ABS pump like glycol based fluid. Silicone is slightly more compressible than glycol fluid. It has a higher wet boiling point because it doesn't absorb moisture like glycol fluid. This lack of moisture absorption causes problems when water gets in the brake system. Instead of mixing with the brake fluid (so it can be flushed out easily), the moisture gets trapped at low points in the system and causes rust. Most daily driver BMW 3 series should stick with DOT4.

Cool-down lap: When the checkered flag is waved at the end of the session the driver should slow the car to a pace that will allow the final lap to be driven with little or no use of the brakes allowing air to flow over the brake pads and rotors. Bringing the car hot into the paddock may result in warped rotors. Do not set the emergency brake. [End of Part 1](#)