
SOLO COURSE DESIGN SEMINAR

Stolen Excerpts from

Solo II

Course Design

version 3.5

**assembled and updated by
Roger H. Johnson (the real)
February 2002**

Fundamentals

- **Conditions of the surface**
 - **Avoid sections of the pavement that are breaking up, bumpy or have gravel or sand on the surface.**
 - **Avoid patches or treated areas (especially on a warm day).**
 - **Beware of fluid spills (oil, fuel, antifreeze, sticky tar, etc).**
 - **Avoid drainage grates, manhole covers, or any other non-movable objects.**

- **Course Workers**
 - **Safe workstation positioning**
 - **Workers should not have to cross one part of the course to get to down cones on another part.**
 - **Station should not be placed in the path of a predicted spin point.**
 - **Must be able to see all of the pylons within their responsibility.**
 - **Pylons must be close enough that the workers can get to them without delaying the start or causing a red flag.**
 - **Workers should only have to watch cars in one direction.**

Fundamentals (Cont'd)

- **Multiple cars**
 - **If necessary, make sure two (or more) cars can safely be on course at once.**
 - **Make sure adjacent sections (crossovers, nearness of course to itself, etc.) do not prevent full use of the time available.**

- **Start and Finish Lines**
 - **Establish clear access to the start and after the finish lines.**
 - **Avoid “Drag Race” starts to ensure a fair start for all competitors.**
 - **You can place a sharp turn immediately before or after the start lights.**
 - **Provide a Safe Finish**
 - **Don’t point the finish towards nearby spectator areas or Grid.**
 - **Allow plenty of room for a safe, controlled, non-dramatic straight shutdown.**

- **Timing & Scoring**
 - **Make sure T&S can easily read the car numbers and view the entire course.**
 - **Position timing equipment and crew clearly out of harms way (such as a spinning vehicle).**

10 Basic Concepts

- 1.) **Be Original, but re-use of other course features is OK.**
- 2.) **Use Creativity. A course that requires Thought to drive fast is Good.**
- 3.) **No Hidden Agendas, don't make course for single-type/class of cars.**
- 4.) **Be familiar with the Solo Course Design Rules in SOLO Rulebook.**
- 5.) **Make the Course Flow, a smooth course is a fun course.**
- 6.) **Use Elements that Favor Horsepower and Elements that Favor Handling.**
- 7.) **Use Pointers and Directional Cones Correctly and Sparingly.**
- 8.) **Line the Course, when possible.**
- 9.) **Place Gates to Avoid Visual Confusion, lead the Driver's eye to next gate.**
- 10.) **Walk/Drive Your Course with the Intent of Improvement.**

Judging Your Success

- **Did you receive unsolicited praise or complaints?**
- **Note the number of delays for course workers, course repair, etc.**
- **Track the number of DNFs for other than mechanical failure**
 - **The goal is zero.**
 - **Acceptable is 1 in 20 on the first run, 1 in 100 there after.**
- **Number and frequency of pylons hit**
 - **The goal is zero.**
 - **Acceptable is 1 car in 10 hitting any; no more than 3 for any one car.**
- **Keep in mind, the main goal of course design is to provide the Solo competitors with Fair, Fun, and Safe Competition.**

Application Of Creativity

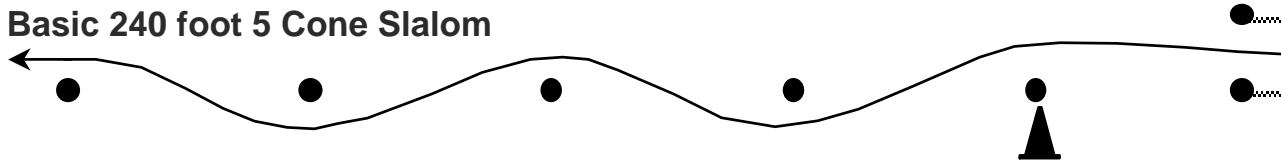
- **Include turns of varying radii and speed**
 - Sweepers should come in various sizes, possibly even with changing radii.
 - Don't design a course consisting primarily of 180° turns.
 - Use 90°, 180°, 60°, fast 45° turns, etc.
- **Provide a variety of car path directions**
 - Use the various turns to send the car in directions not always perpendicular or parallel to the site outside perimeter or the site markings on the surface such as paint stripes or concrete squares.
- **Provide a variety of transients**
 - Straight slaloms / offset slaloms (even curved slaloms).
 - Sequences of offset gates.
 - Lane changes.
 - Combinations of the above.
 - **Challenging courses include combinations of transients that require a precise proper entry into the first part of the combination in order to drive through the entire combination quickly.**

Application Of Creativity (Cont'd)

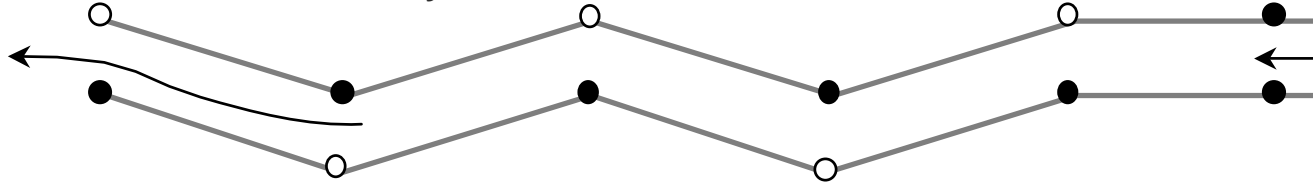
- **Provide sufficient “Input Density”**
 - **“Input Density” is a measure of direction-changing inputs which the driver must give to the car to negotiate the course divided by the length of the course.**
 - **A good course has 25 to 35 inputs over a distance of approximately 3/4 mile.**
 - **A less interesting course will have only 15 to 20 inputs for the same distance.**
 - **If “Input Density” is over 45 inputs for 3/4 mile, odds are that the design is too busy.**
 - **Results of Too Great an “Input Density”**
 - **Drivers will never seem to have the time or room to set up for the next feature.**
 - **Drivers feel they are thrashing through the course, “just trying to survive” until the finish.**
 - **Results of Too Little “Input Density”**
 - **A boring, non-challenging course to drive.**
 - **All times run are approximately the same.**

Slalom

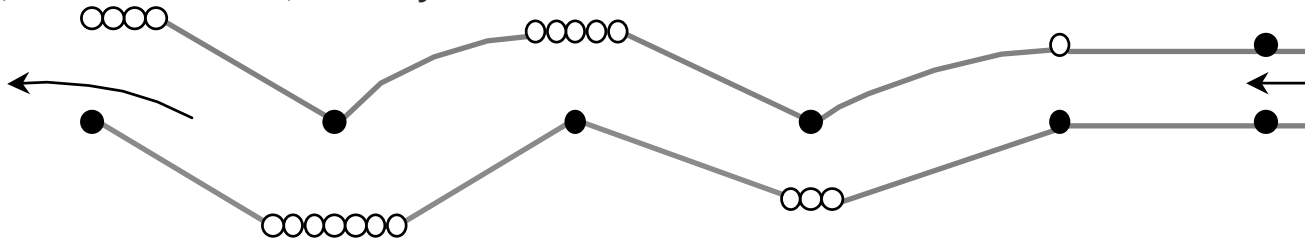
Version A; Basic 240 foot 5 Cone Slalom



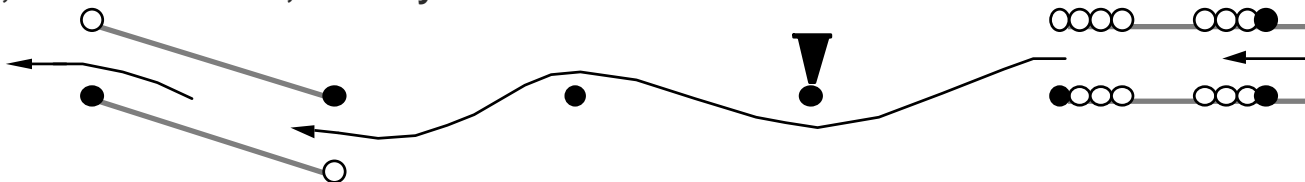
Version B; Same Maneuver, Visually Different



Version C; Same Maneuver, Visually Different

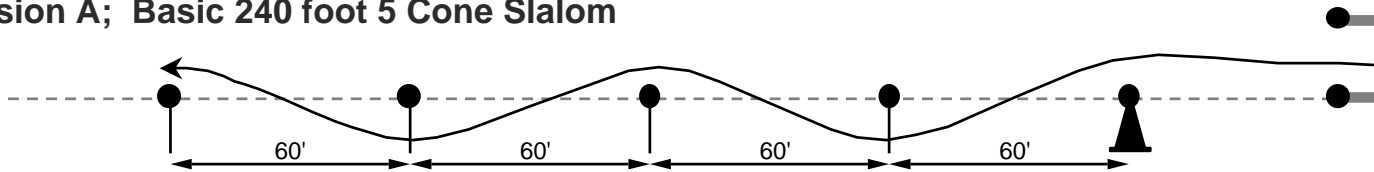


Version D; Same Maneuver, Visually Different

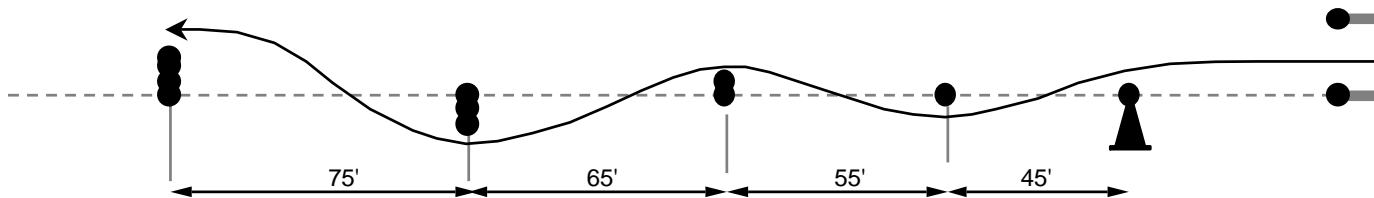


Slalom (Cont'd)

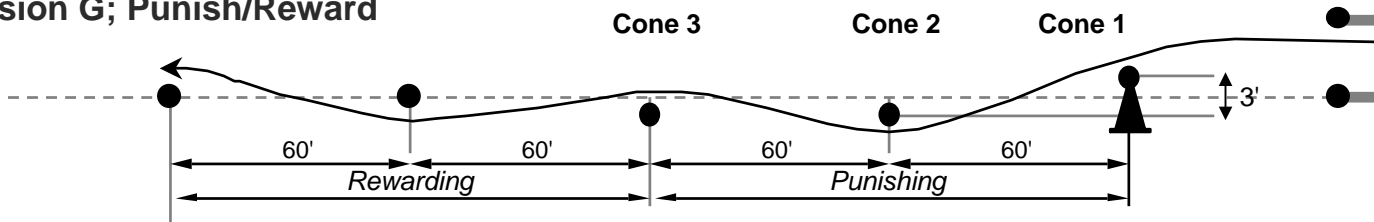
Version A; Basic 240 foot 5 Cone Slalom



Version F; Change for Interest



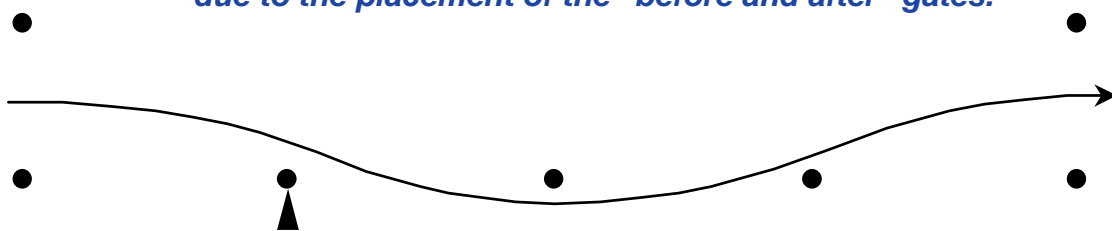
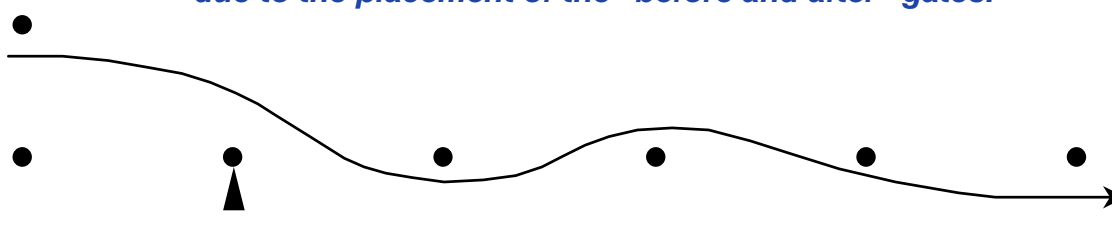
Version G; Punish/Reward



Note: Cones 1 & 2 are offset 3' the hard way with cone 3 offset 1.5' the easy way. This opens up a "skinny car freeway" through the last three cones of the slalom. To make the punishment bearable, be sure to allow adequate set up area prior to the punishment, otherwise the punishment becomes painful.

Slalom (Cont'd)

Placement of the gate “before and after” the start and finish of a slalom is critical as to the amount of turns that the slalom actually becomes.

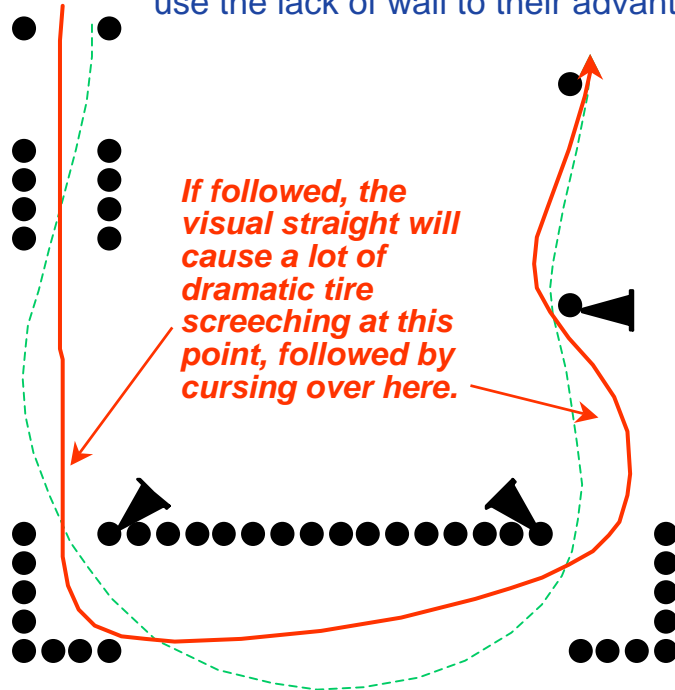
<p>3 Cone Slalom</p> 	<p><i>The intent of a three cone slalom is usually to make 3 turns. As you can see from this example, this slalom has become 1 turn due to the placement of the “before and after” gates.</i></p>
<p>4 Cone Slalom</p> 	<p><i>The intent of a four cone slalom is usually to make 4 turns. As you can see from this example, this slalom has become 2 turns due to the placement of the “before and after” gates.</i></p>

“The Brainer” Corner

The intent of “The Brainer” is to allow a fast line through, but give it the visual effect of a slow maneuver. This will then give the competitor a reward (quicker time) for figuring it out.

The “Brainer”

The wall at the 180° will tend to make an unwary competitor square the corner out. The driver who looks carefully will round the corner out and use the lack of wall to their advantage.

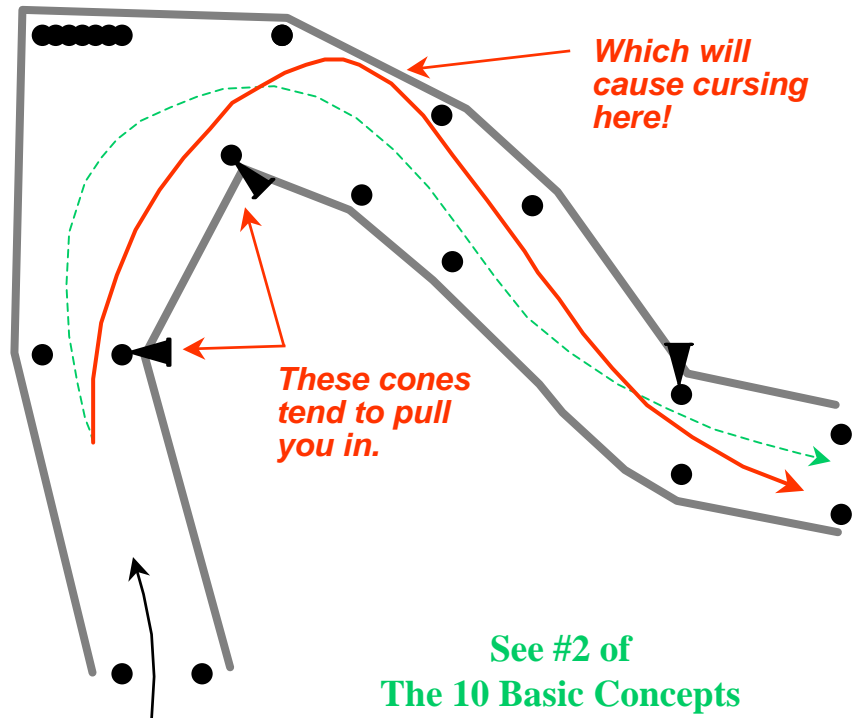


If followed, the visual straight will cause a lot of dramatic tire screeching at this point, followed by cursing over here.

Note lack of wall here.

The “Brainer”

Competitors that don't "read" the course tend to drive cone to cone. The indicated cone will tend to pull in a driver who has not thought this one out. The fast line is to stay wide to make a sweeping turn.



Which will cause cursing here!

These cones tend to pull you in.

**See #2 of
The 10 Basic Concepts**

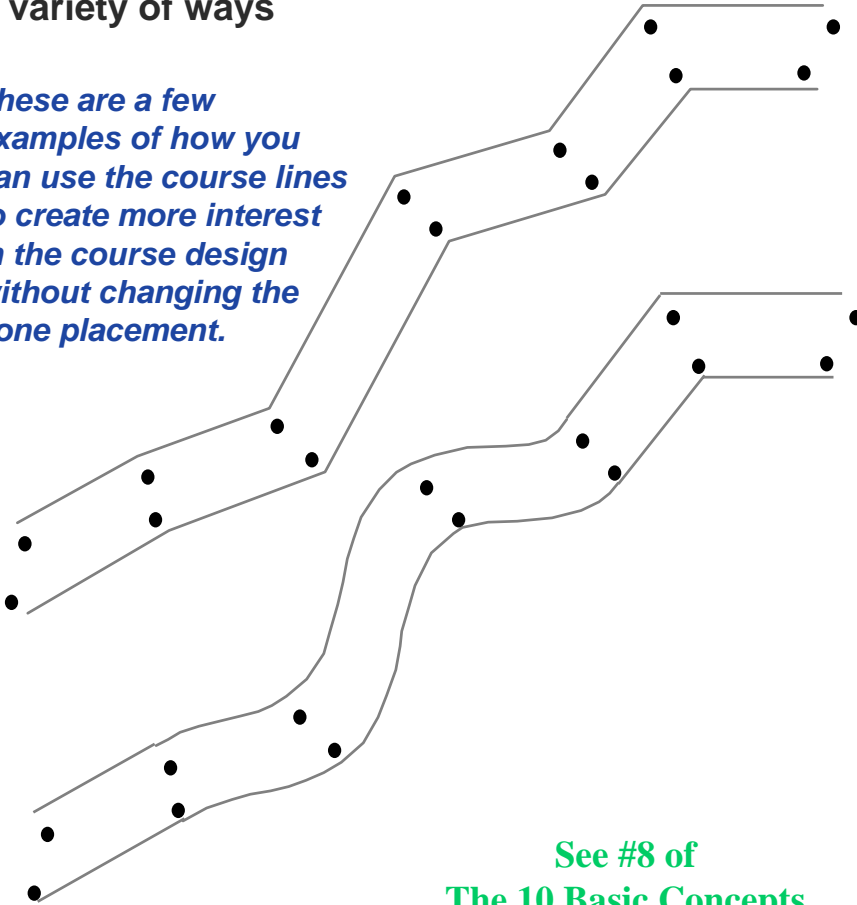
Course Lining

- **Line the course whenever possible because it makes it much easier for the inexperienced driver to make it through the course without an embarrassing DNF.**
- **The course should NOT be line dependent.**
 - **If it rains, the course must still be able to be seen and negotiated successfully if all of the lines are washed away.**
- **The lining of the course is intended to be a visual aid in basic course negotiation and not an indication of the correct line to drive.**
 - **Care should be taken to avoid the “correct line” passing over the course lines.**
 - **Lines should be outside the cones but should not be so far outside the cones as to fall outside of the driver’s easy field of vision; 1 foot or less is a good guideline to use when lining outside of the cones.**
- **What to use (in order of preference)**
 - ***Flour:* Non-caustic environmentally friendly, easy to find, inexpensive, bright on pavement, smells like a Bakery!**
 - ***Gypsum:* Non-caustic, relatively easy to find, relatively inexpensive, bright on pavement, gets hard after being wet, may leave semi-permanent marks.**
 - ***Marble Dust:* Non-caustic, hard to find, somewhat expensive, not bright on pavement.**
 - ***Fertilizer:* Caustic, easy to find, expensive, not bright on pavement, promotes weed growth in cracks.**
 - ***Lime:* Extremely caustic, relatively easy to find, relatively inexpensive, bright on pavement.**

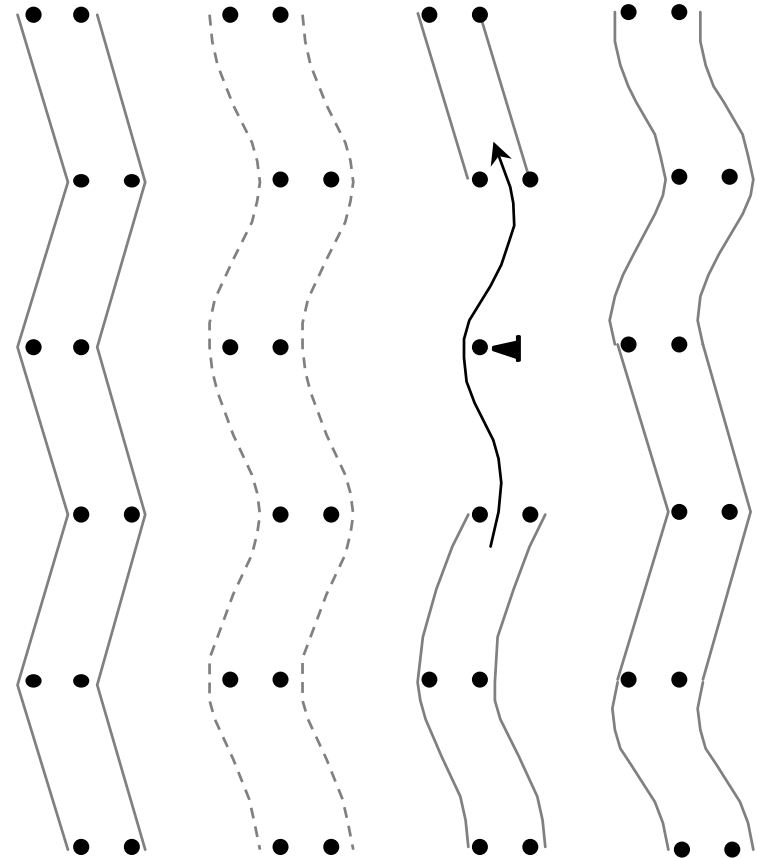
Course Lines

Use the course lines in a variety of ways

These are a few examples of how you can use the course lines to create more interest in the course design without changing the cone placement.



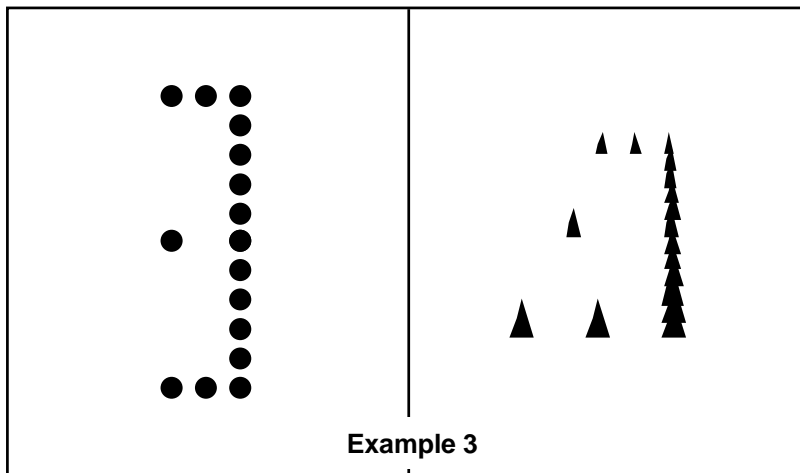
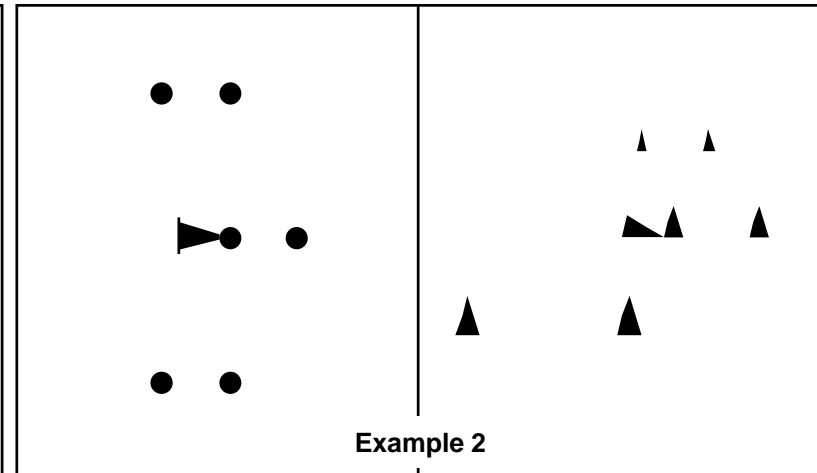
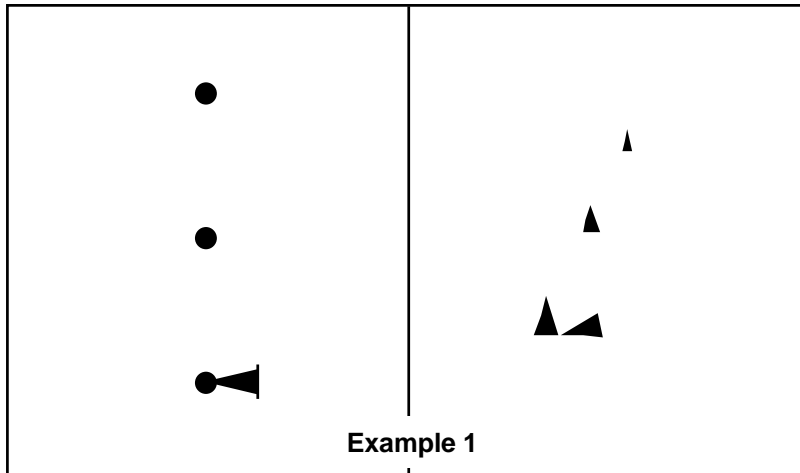
See #8 of
The 10 Basic Concepts



Lines do not have to be solid, only need to be readily visible (dashes save materials).

Visualization

All three of these are a slalom - the same maneuver. Obviously, **Example 1** is easiest to see.



You must also consider if the inclusion of your “creative” cone placement has reduced the clarity of the course significantly.

In this case, the surrounding cones from the following maneuvers may impact the clarity of these examples as well. For instance, if you have several walls of cones just following this slalom, Example 1 would be most appropriate. If there were not, Examples 2 or 3 might be appropriate.

See #9 of
The 10 Basic Concepts

SCCA Course Design Rules

Solo Course Design Rules can be found in Section 2 of your Solo Rulebook.

- The obvious advantage to knowing the rules in Section 2 is that you will be more likely to create a design that will be considered a Solo type course, as well as a course that is acceptable to the assigned Safety Stewards and your competing peers.
- The following are some quotes from those rules. ALL of the rules, of course, are important and should be known and understood. These are just the rules that I perceive to have the most impact on your design decisions.

1.3 Common Sense And Solo Courses

2 “Solo courses should be open enough to allow good competition between larger and smaller cars and should not emphasize high speed, power to weight ratio, extreme maneuverability or visual acuity...”

2.1.A “...Speeds on straight stretches should not normally exceed the low 60’s (mph) for the fastest Stock and Street Prepared category cars. The fastest portions of the course shall be those most remote from the spectators and property. Turns should not normally allow speeds in excess of 45 mph in unprepared cars...”

See #4 of

The 10 Basic Concepts 15

SCCA Course Design Rules (Cont'd)

- The following are some more quotes... (continued)
 - 2.1B “The course as laid out shall be on a paved surface which contains no dangerous holes, loose gravel, gratings, oily spots, or other hazardous features. Dips that could get a car airborne shall not be included.”
 - 2.1.C “The course boundary shall not normally pass closer than 25 feet from solid objects.”
 - 2.1.D “...disapprove a course or site for karts only, when there are upright solid objects (e.g. light poles, fence posts, etc) on site within 50 feet of the actual course. This does not include curbs...”
 - 2.1.E “Negative cambered turns will be avoided if at all possible.”
 - 2.1.F “A long straight (over 150 feet) should not terminate in an extremely sharp turn...”
 - 2.1.H “Cars on course simultaneously shall not run in close proximity to each other.”
 - 2.1.I “All portions of the course shall be visible to at least one Course Marshal who can communicate through signals or by electronic means with the starting line.”

SCCA Course Design Rules (Cont'd)

- The following are still more quotes... (continued)

2.1.K “Entrance and exit lanes shall enter the course at separate points, though they may be close together...”

2.1.M “Participants and non-participants must be kept at a safe distance...
...minimum viewing distances may not be less than 75 feet from the course edge in unprotected areas (areas without adequate barrier protection such as concrete or tire walls)...”

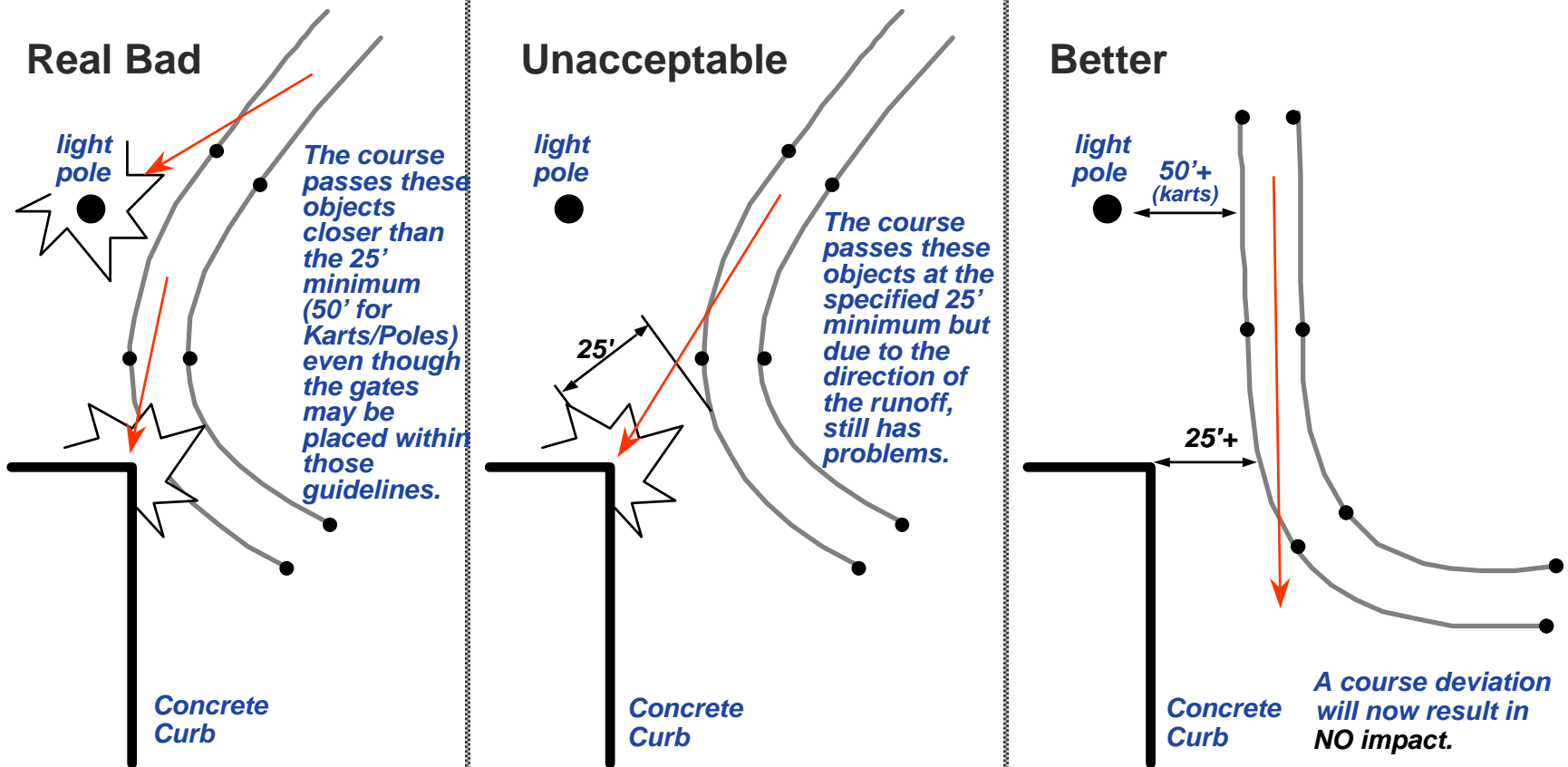
2.2.B “The course shall be at least 15 feet wide and single file slalom markers shall be at least 45 feet apart. Any series of course markers which are generally in a line and have the effect of a slalom are considered to be a slalom...”

2.2.C “A Solo event, other than a gimmick event in which time is not the only consideration, shall be a test of driving skill, not memory.”

2.2.E “Cars should leave a gate/turn headed generally in the direction of the next gate/turn.”

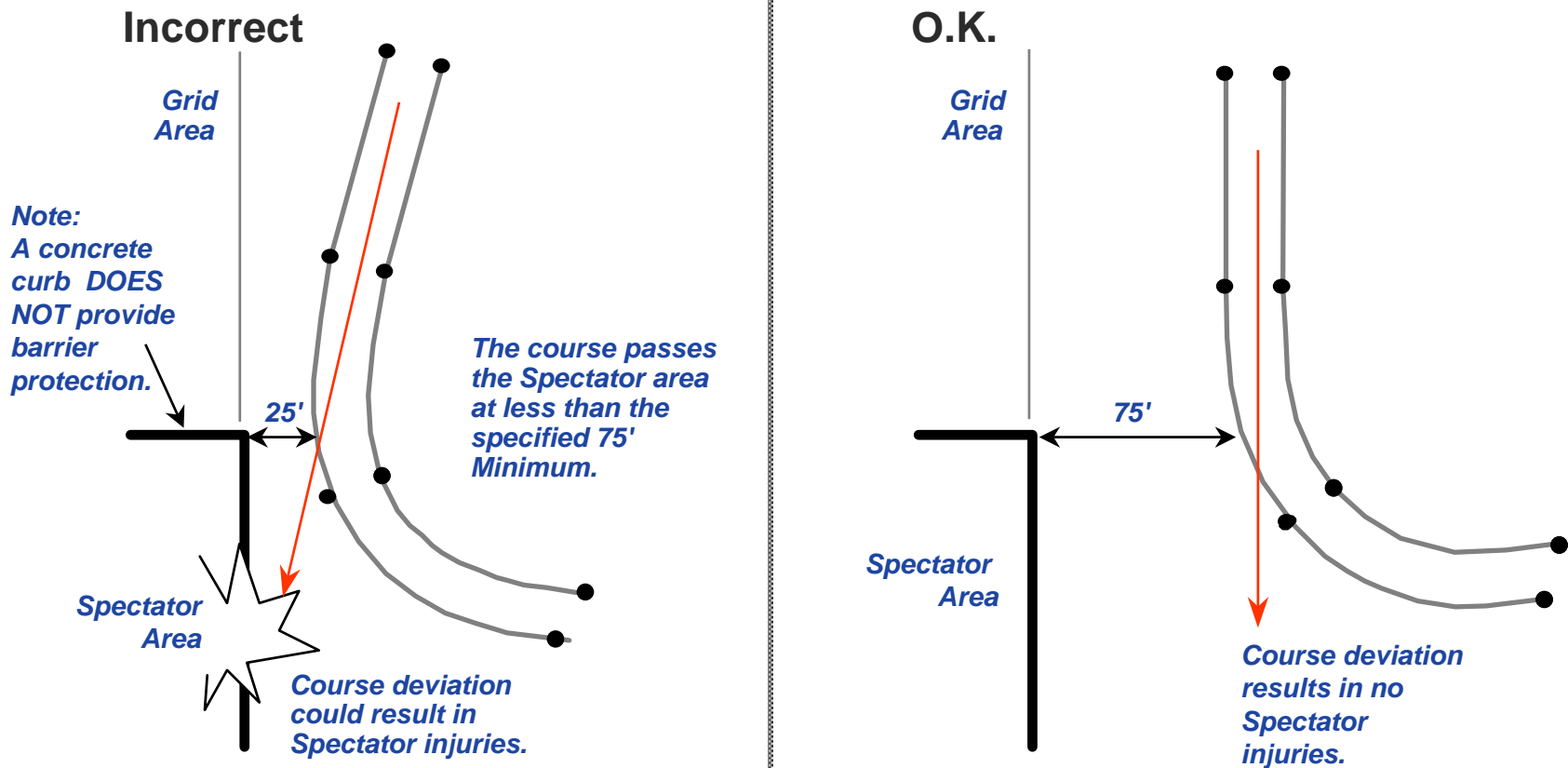
Course Boundaries/Hazards

The “better” example shown here is considered minimum.
Greater distances from Stationary objects is always better.



Course Boundaries/Hazards (Cont'd)

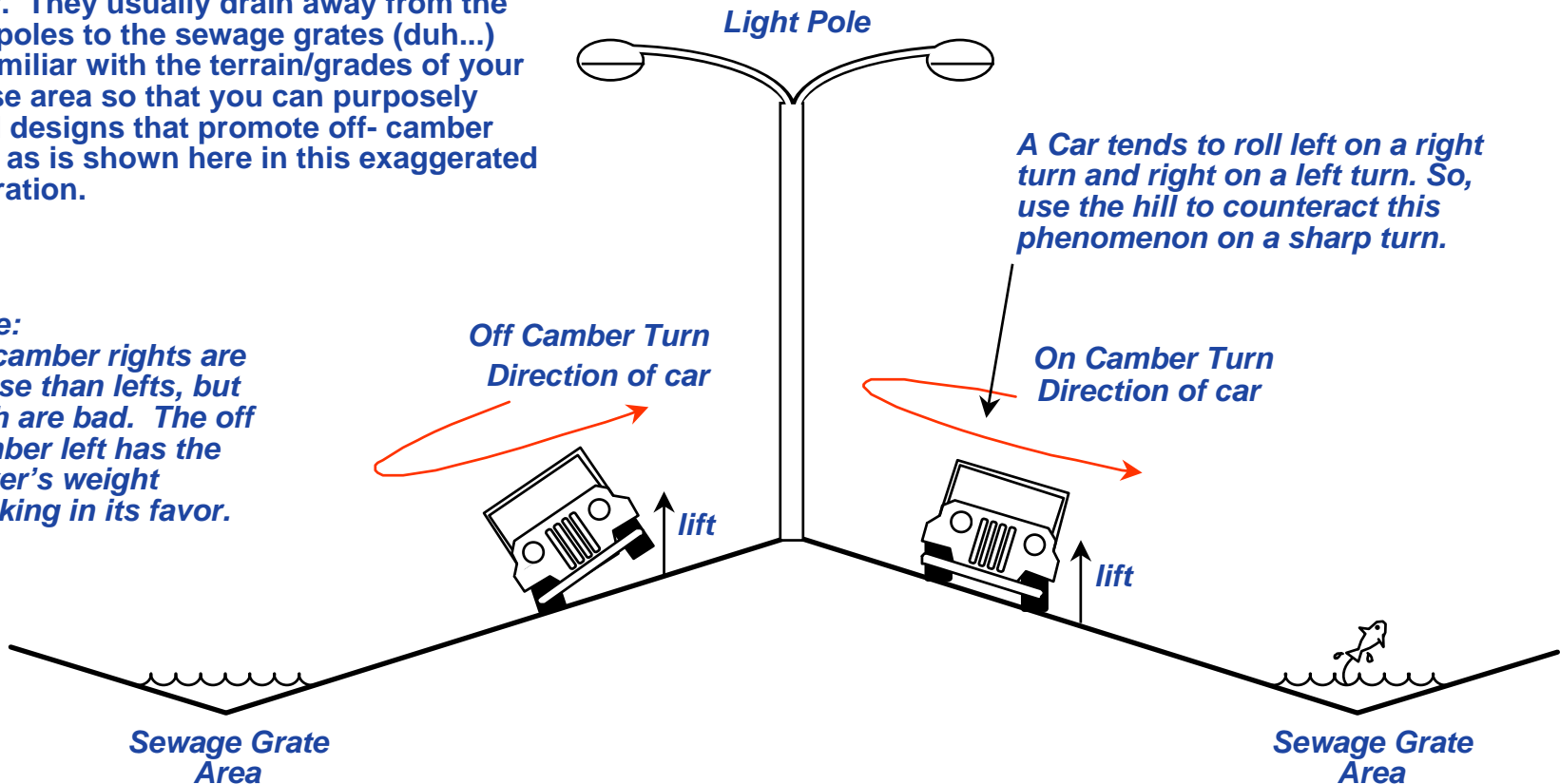
The preferred example shown here is considered minimum. Greater distances from Spectator Areas are always better. Fast course sections should never aim directly at spectator areas without very large runoff distances.



Course Boundaries/Hazards (Cont'd)

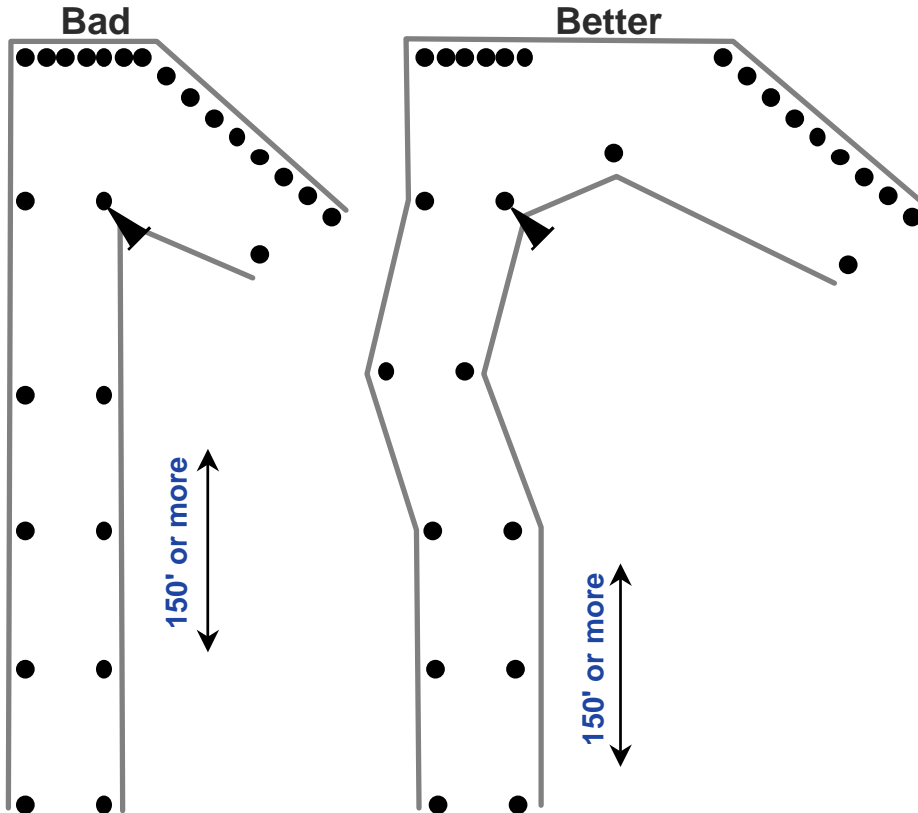
Parking lots generally have a slight grade built into them to promote drainage of water. They usually drain away from the light poles to the sewage grates (duh...) Be familiar with the terrain/grades of your course area so that you can purposely avoid designs that promote off-camber turns as is shown here in this exaggerated illustration.

Note:
off camber rights are worse than lefts, but both are bad. The off camber left has the driver's weight working in its favor.



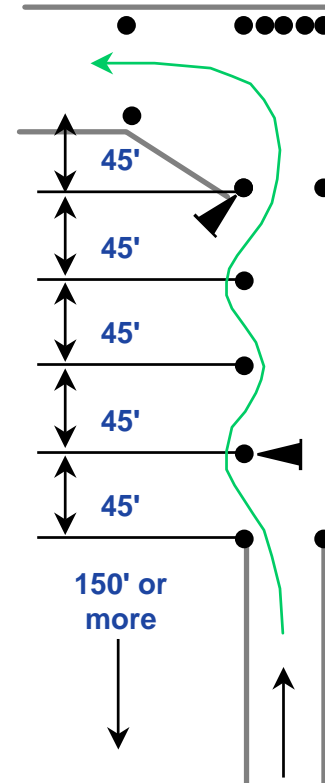
Course Layout

A long straight (over 150') should not terminate in an extremely sharp turn...

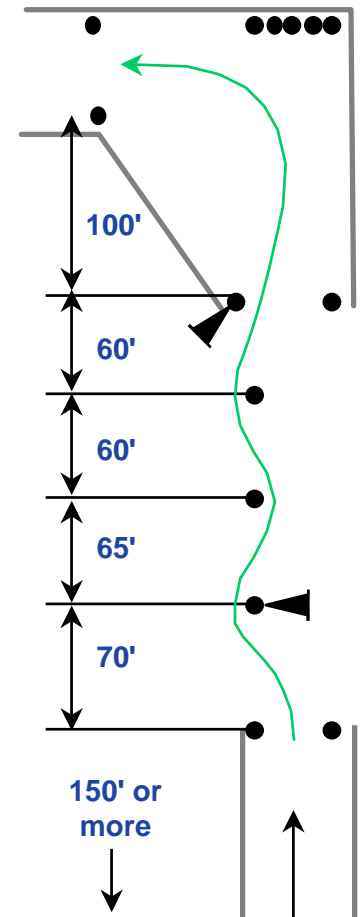


Plagiarized & Embellished by G.L. Obenour

Bad
A sharp turn following
a high speed entry
into a tight slalom.



Better
A more gradual turn
here following a less
drastic slalom.

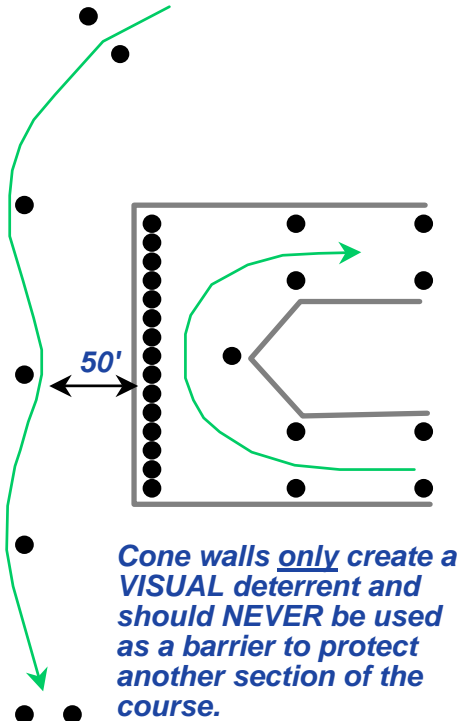


Solo Seminar at Andersen Logistics,
Indianapolis, IN - March 25, 2006

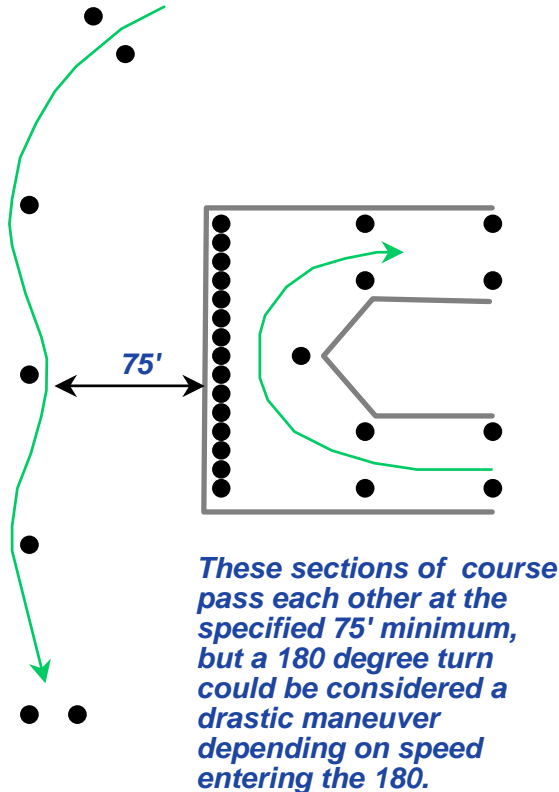
Course Layout (Cont'd)

"Close Proximity"... The definition of this is ultimately up to the Safety Steward, but if you consider rule 2.1.L, the absolute minimum would be 75'. Obviously, the more drastic the maneuver, the more space that should be allotted. The whole idea of this rule is to keep two competitors from colliding in the event of one (or both) of them losing control or getting lost on course.

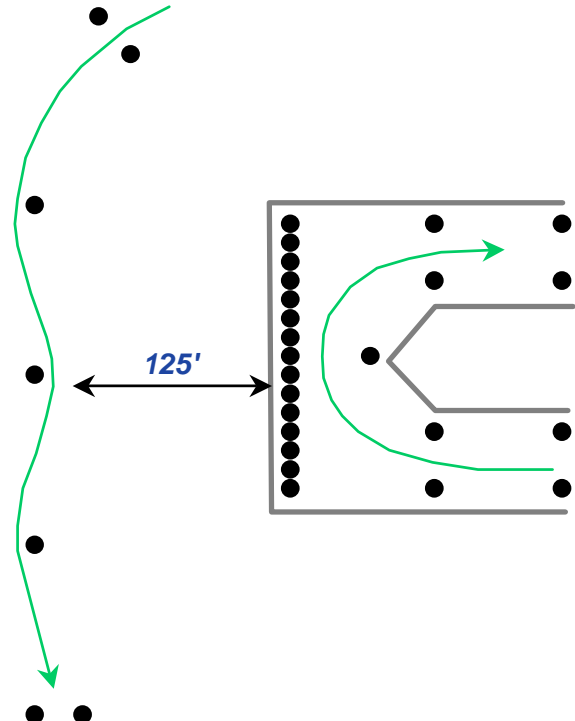
Unacceptable



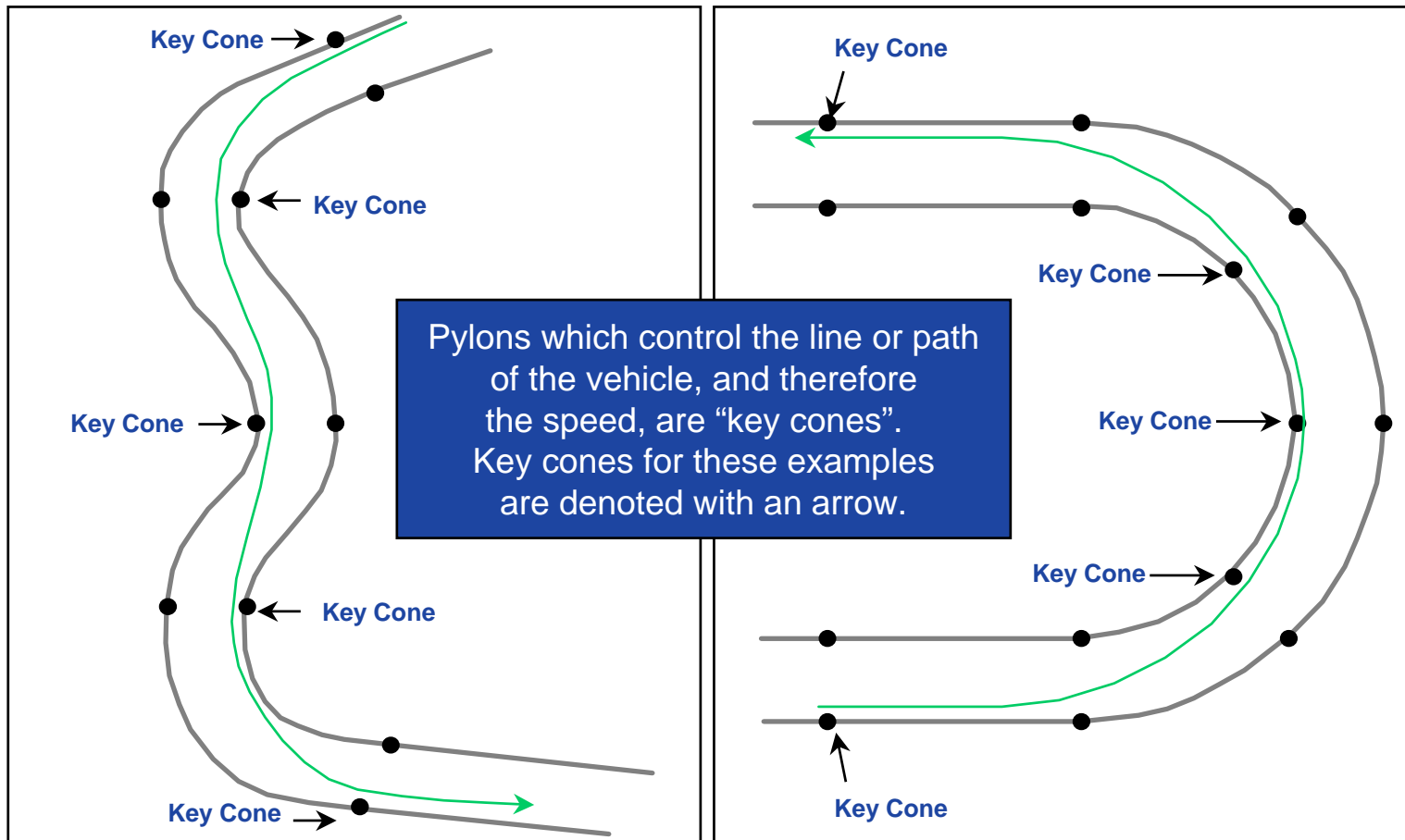
Better



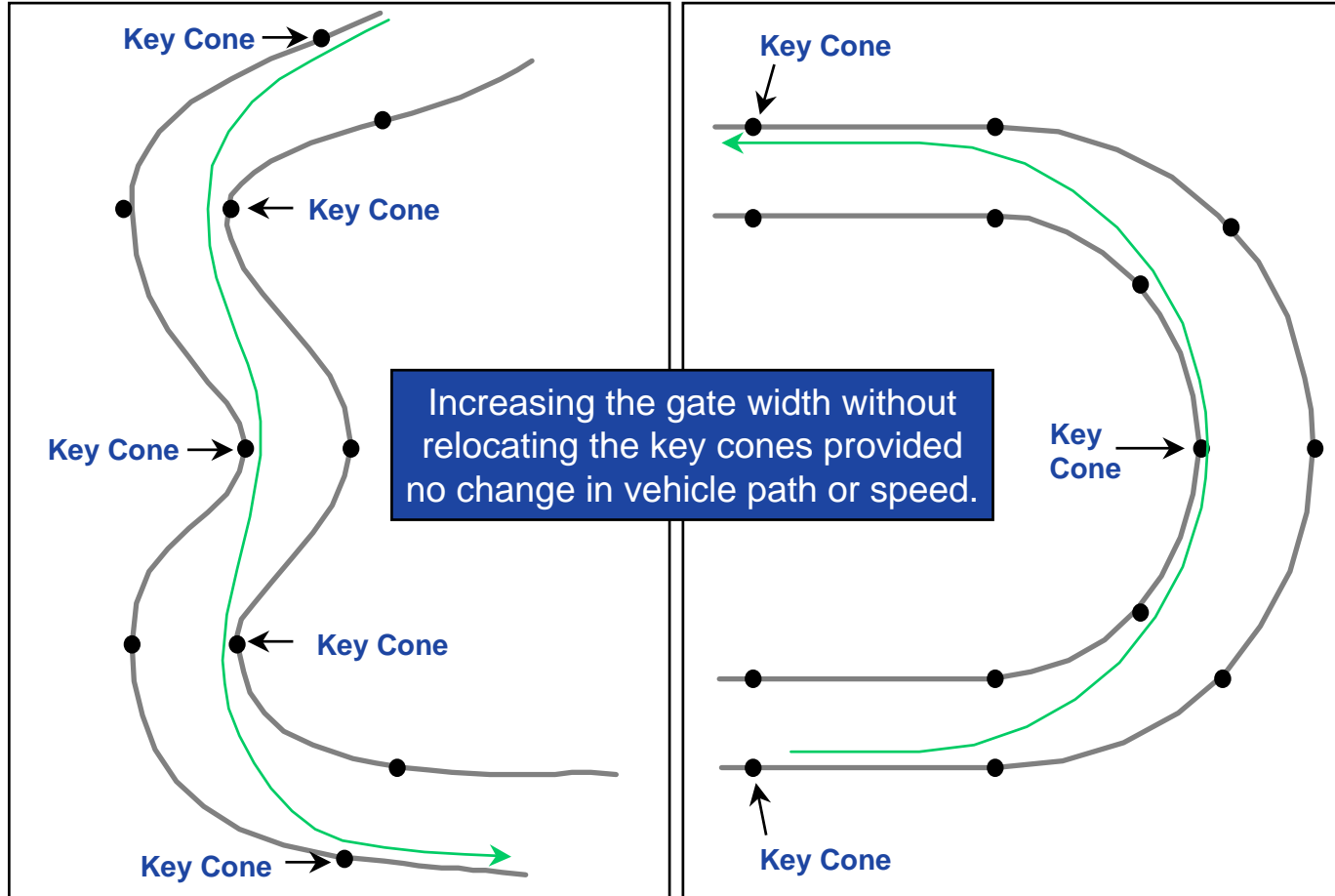
Better Yet



Course Layout (Cont'd)



Course Layout (Cont'd)



Increasing the gate width without relocating the key cones provided no change in vehicle path or speed.

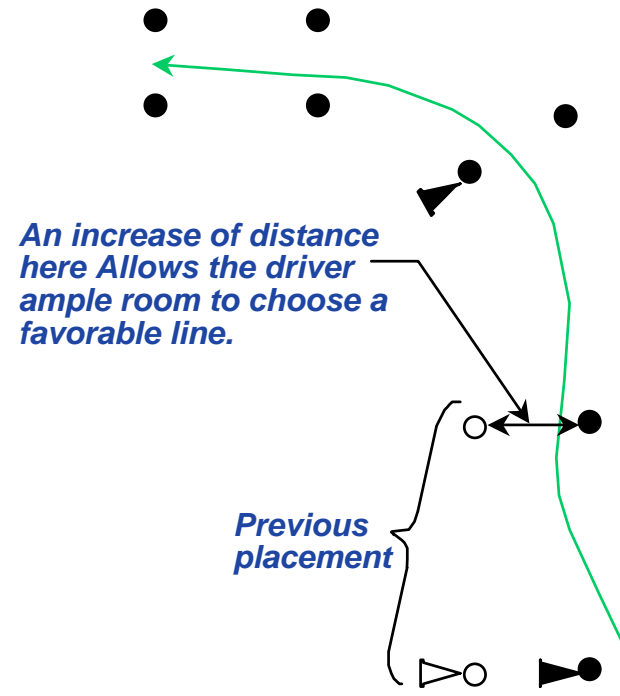
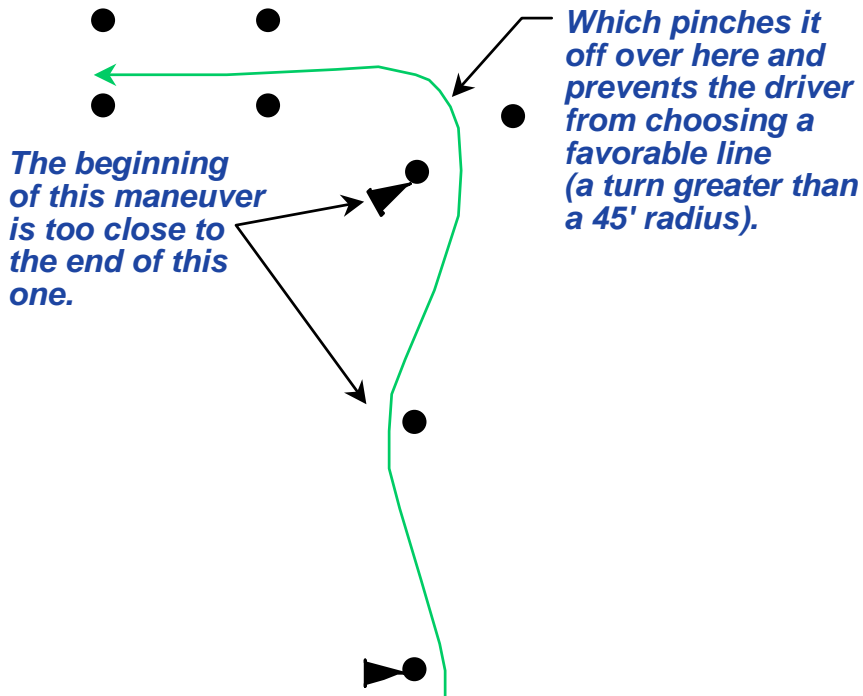
Advantages of Wider Gates

- Choosing the superior line requires more skill and experience.
- Allows for mistakes/sloppiness with no pylon penalties.
- Easier on Course Workers and Timing & Scoring.

Course Layout (Cont'd)

- Allow a minimum of a 45' radius in your turns.
- Allow the driver ample room to choose a favorable line.

Below is an example of what I believe to be a better solution with the same "flavor" as the original idea.

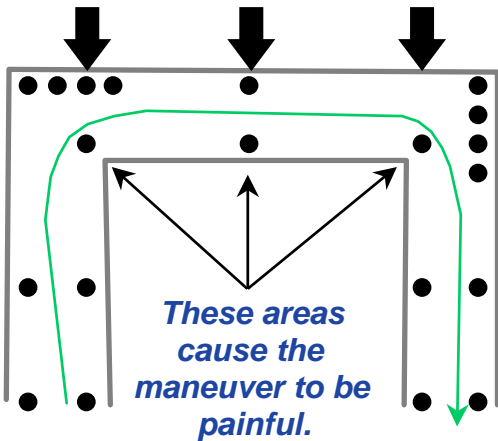


Note:
There are usually a variety of ways to accomplish this effect. In this case, moving the last 2 gates farther up and leaving the slalom where it was placed originally would have worked as well.

Course Layout (Cont'd)

Painful

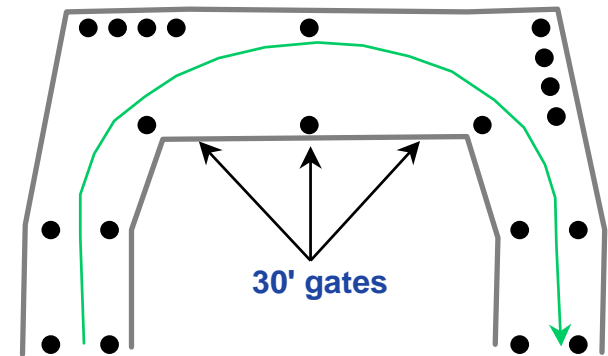
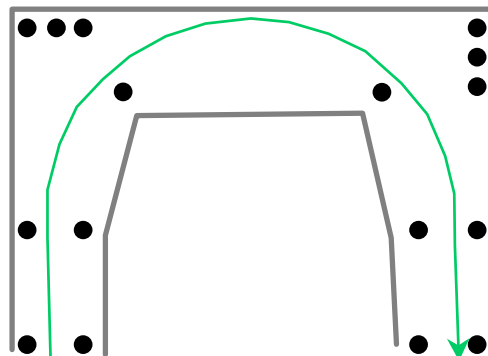
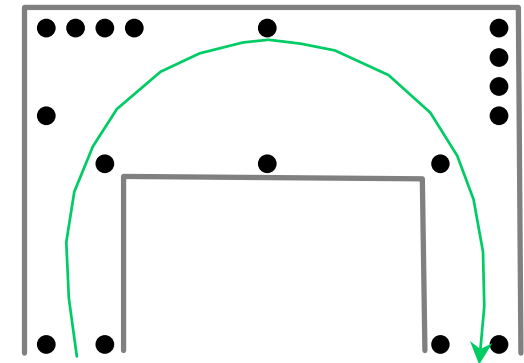
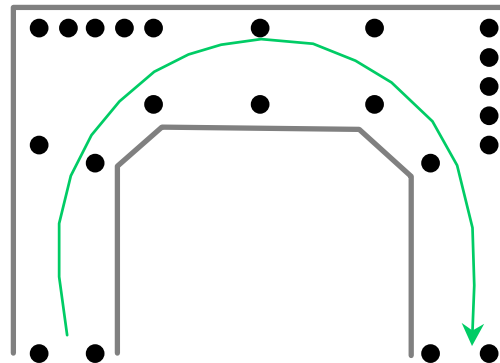
Narrow, "walled in" sharp turns



The problem associated with narrow "walled in" turns is that the placement of the wall forces the turn to be made up of 2 or more painful turns instead of a flowing turn.

Better

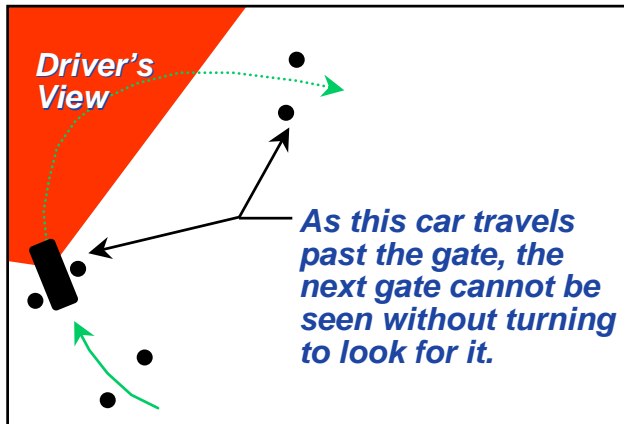
Solutions keeping the same flavor as the original.



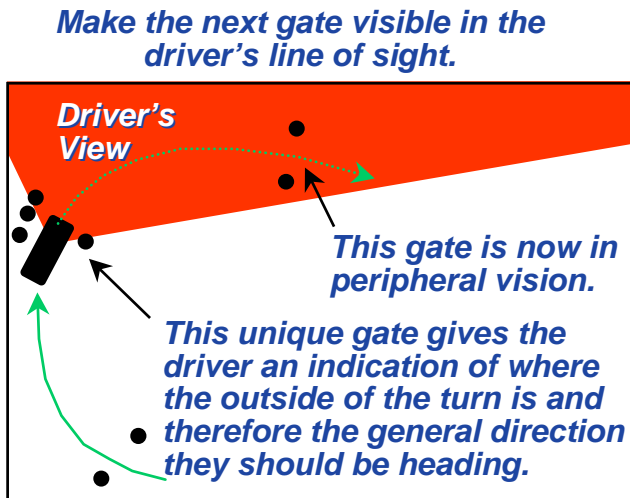
18' gates

Course Layout (Cont'd)

Bad

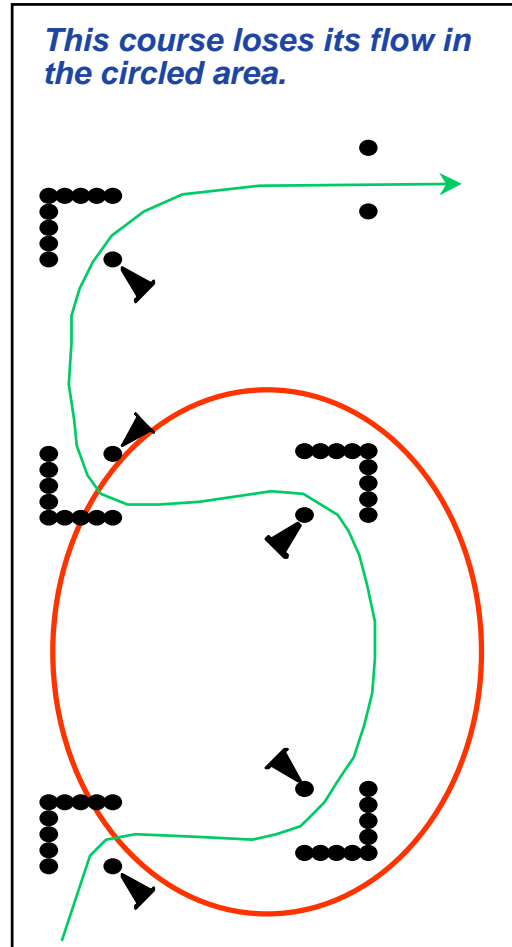


Better



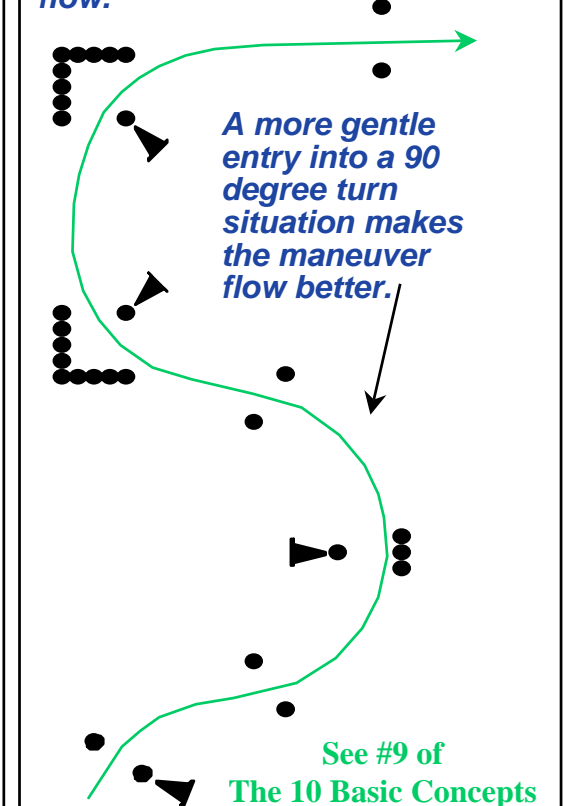
Bad

Improper use of 90 degree turns will quickly inhibit the flow of the course.



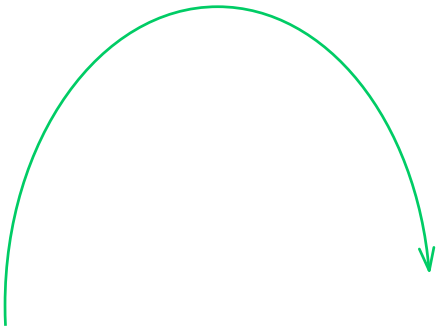
Better

The same basic car path can be retained by placing the gates in this manner without losing the flow.



Course Layout (Cont'd)

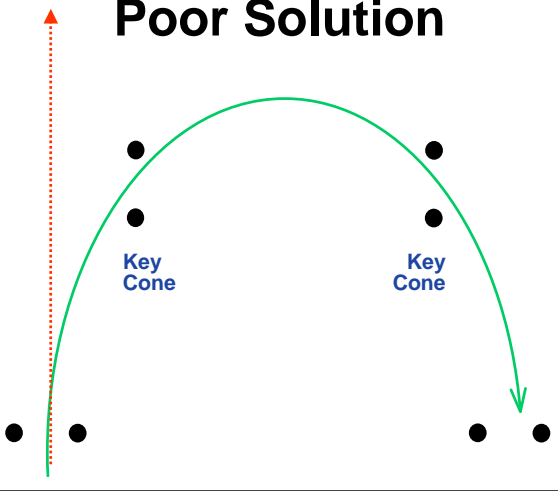
Basic Maneuver



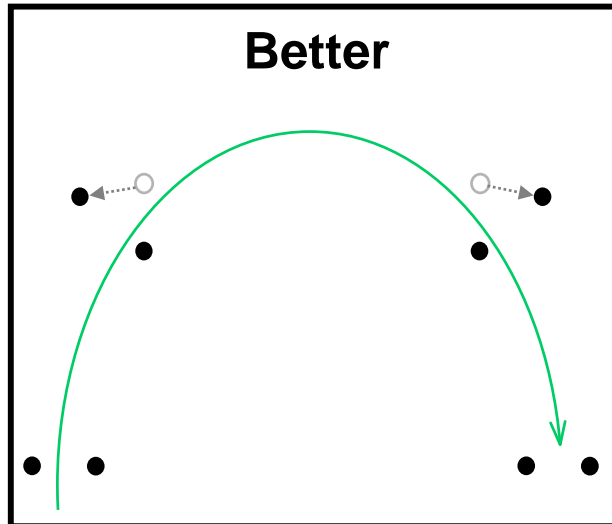
The “poor solution” shown below is a typical mistake new course designers make. This effect occurs when every gate or visual is placed perpendicular to the course edges, such as when the parking spaces are used as guidelines for gate placement. Unless your course is a box, this can be confusing (and who wants to drive a box?).

The “poor solution” (lower left) gate placement satisfies the criteria discussed on the previous page, but it is still confusing to drive. Although the next gate is in the line of sight, the gate angle does not necessarily draw the driver in that direction - there is nothing about the gate placement that would keep the novice driver from going straight. Determine which are NOT key cones, and move those cones to lead the driver in the direction you desire as the following 2 “better” examples do. The “trick” is to place the gate perpendicular to the intended path of the car and ignore any parking space lines or concrete squares when determining the angle of the gate.

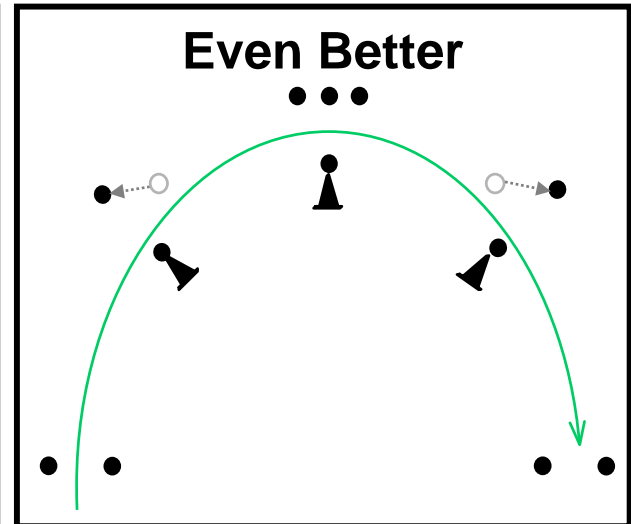
Poor Solution



Better

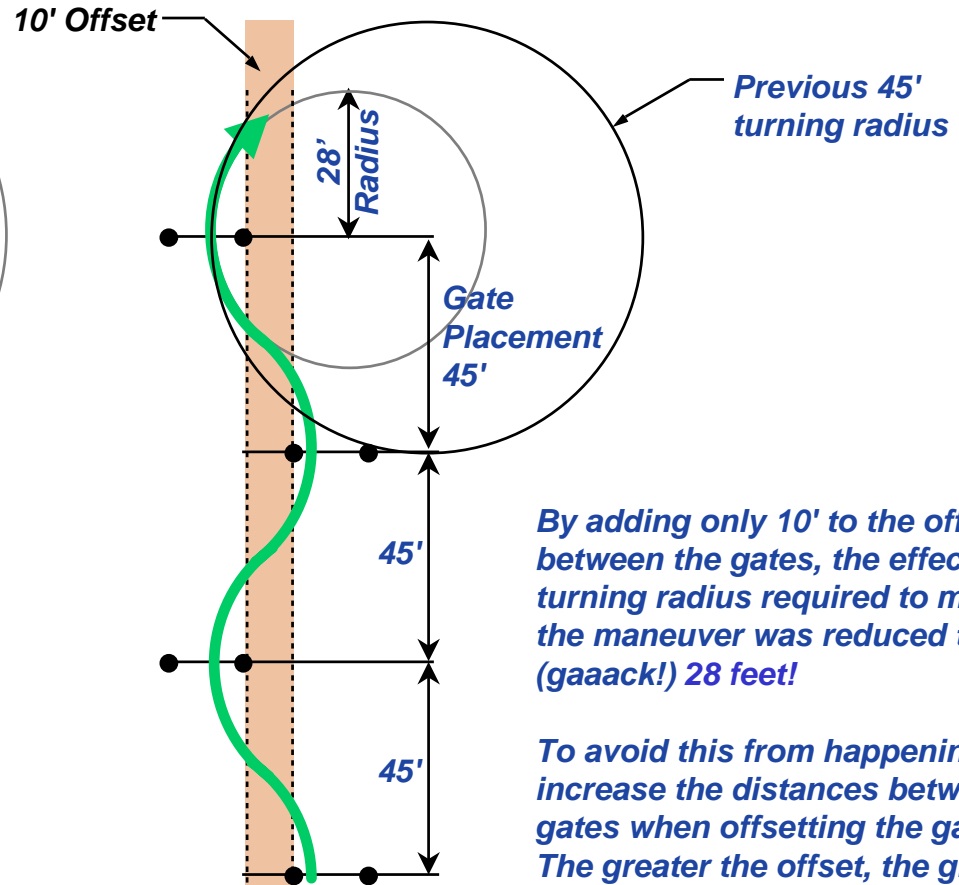
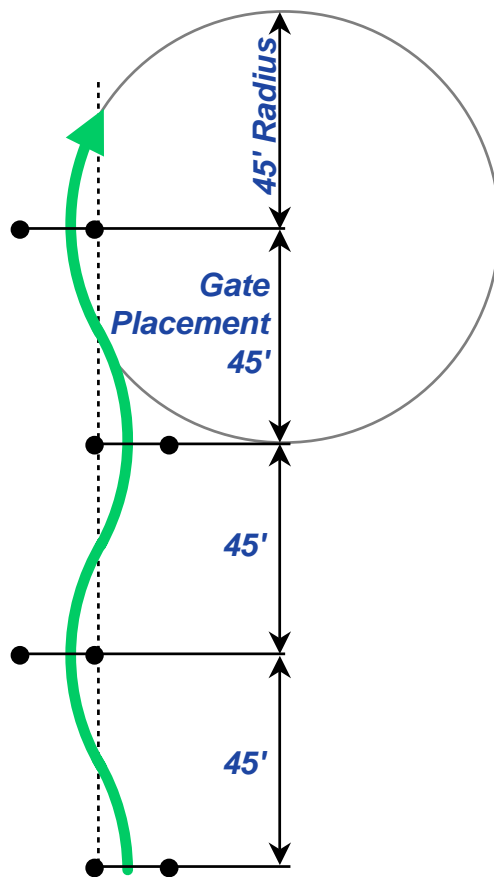


Even Better



Course Layout (Cont'd)

No lock-to-lock turns!

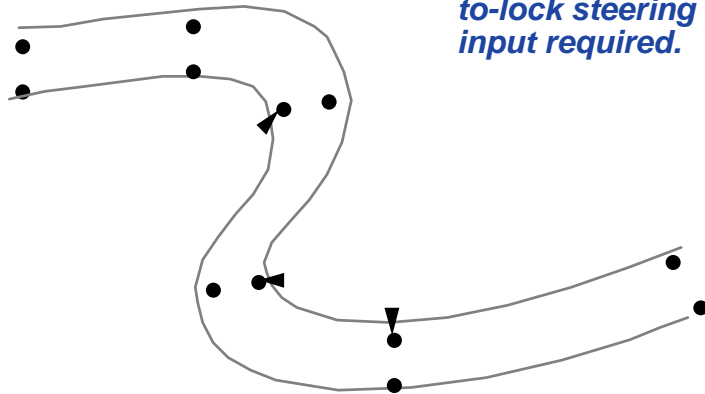


By adding only 10' to the offset between the gates, the effective turning radius required to make the maneuver was reduced to (gaaack!) 28 feet!

To avoid this from happening, increase the distances between the gates when offsetting the gates. The greater the offset, the greater the distance between the gates.

Course Layout (Cont'd)

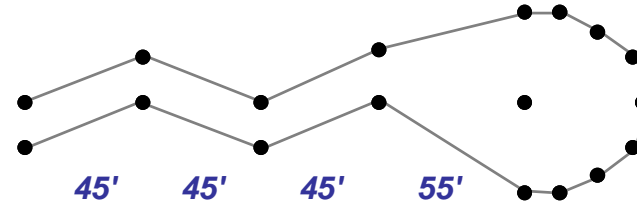
Not Fun



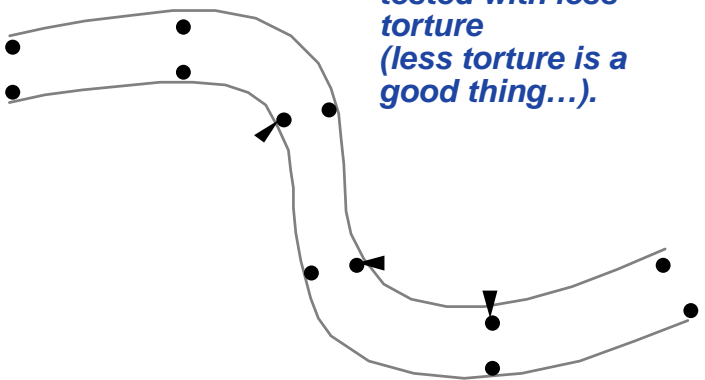
Too much lock-to-lock steering input required.

Painful

Generally, avoid 180° turns. The shape of some lots require a 180° turn; however, so don't make them painful with lock-to-lock steering inputs just before entering the 180.



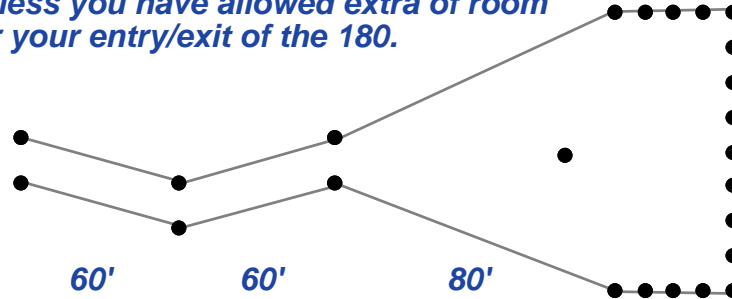
Better



Same driving skills tested with less torture (less torture is a good thing...).

Better

- *Open up the entering maneuvers.*
- *Allow plenty of setup room to enter a 180° turn.*
- *Align your entry/exit gate centered to the 180 cone, unless you have allowed extra of room for your entry/exit of the 180.*

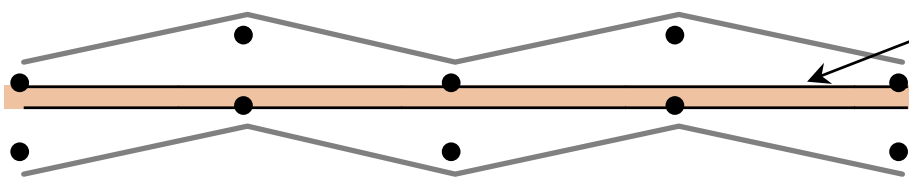


Entering maneuvers "Set up" area

Course Layout (Cont'd)

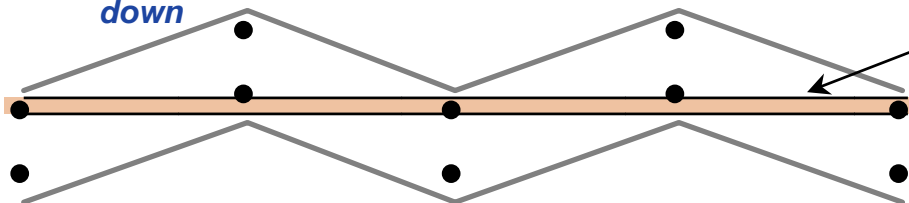
Use either easy or difficult maneuvers to speed up or slow down a course without disrupting the flow.

Version "A"
Speed things up



By increasing this gap, you will effectively increase the speed of the maneuver. A small increase (e.g. one foot) will have a surprisingly large effect.

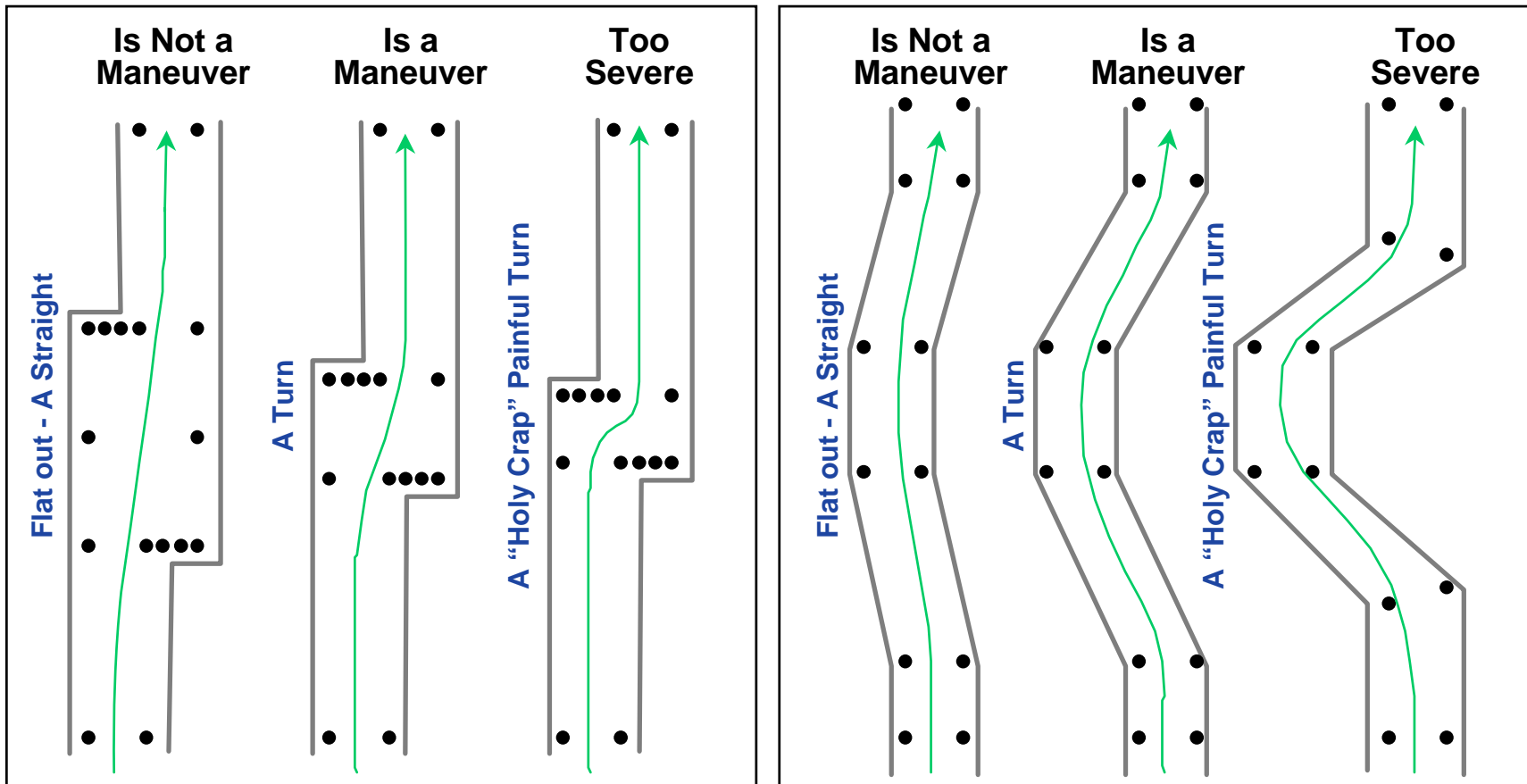
Version "B"
Slowing things down



By increasing this overlap, you will effectively decrease the speed of the maneuver. A small increase here will also have a surprisingly large effect.

Course Layout (Cont'd)

While setting up your course, check to see that all maneuvers are indeed maneuvers. Also ensure that they are not more severe than you intended.



Course Layout (Cont'd)

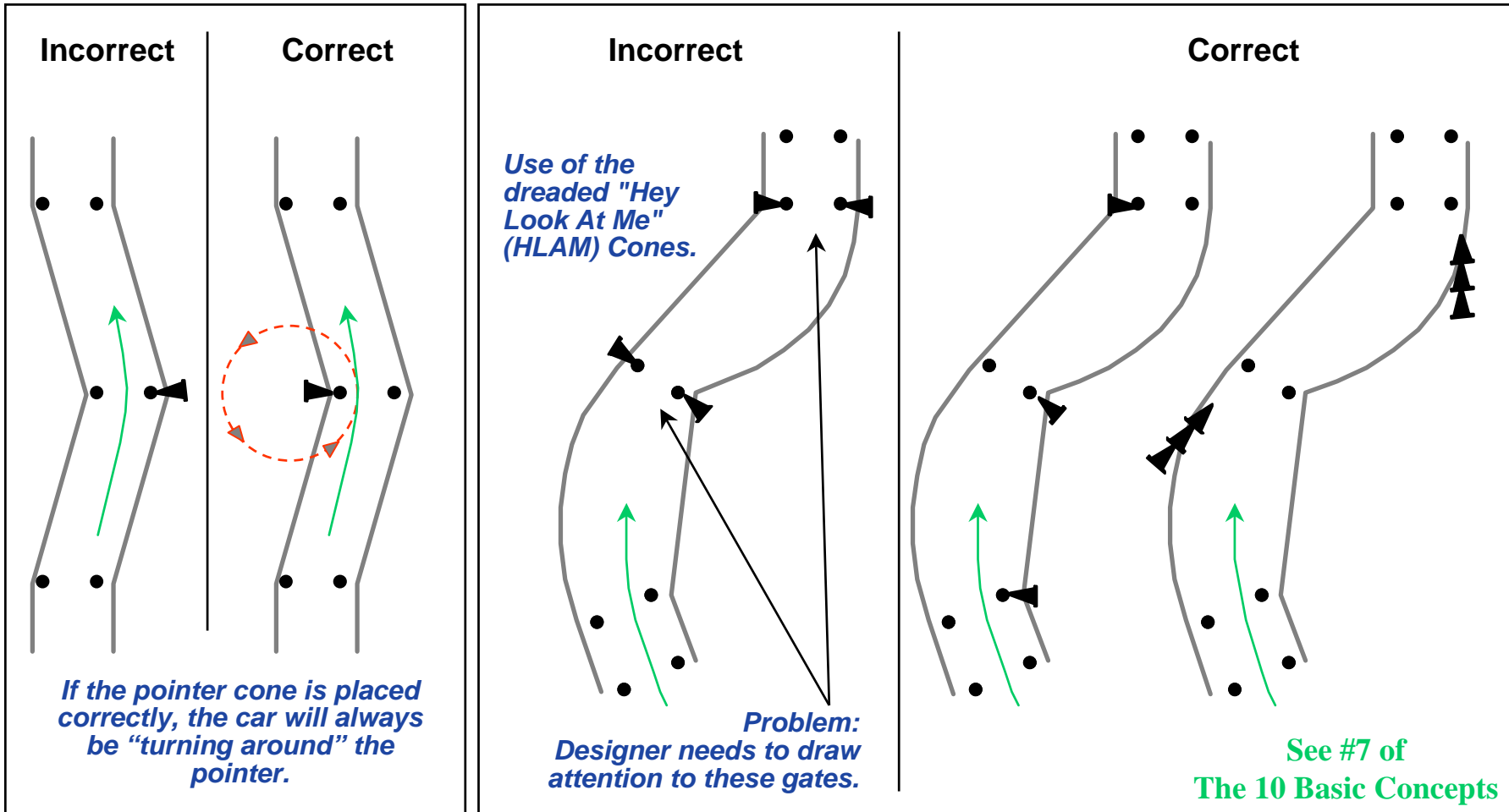
- **Pointer Cones**

- A single lay down cone at the base of a standing cone
 - The purpose of a Pointer cone is **ONLY** to indicate the inside of a turn (usually near the apex) - use them sparingly.
 - Your car will always turn around a Pointer when you negotiate the course if it is placed correctly.
 - Do not use "Hey-Look At Me" (HLAM) cones - Pointer cones on both sides of a gate
 - These can be confused with a down cone that a worker has not noticed.
 - HLAM cones can make an experienced driver turn the wrong way since Pointer cones are supposed to be on the inside of a turn.

- **Directional Cones**

- A series of lay down cones (2 or more) to guide the driver's to the left or right
 - The "big secret" to effective use of Directional Cones is choosing a set number of cones (such as 3) and always use that amount when placing Directional Cones on the course.
 - This creates a recognizable pattern anytime a driver sees 3 layed down cones, telling them that it is a Directional Cone set and not some cones the course workers missed.

Course Layout (Cont'd)



Course Layout (Cont'd)

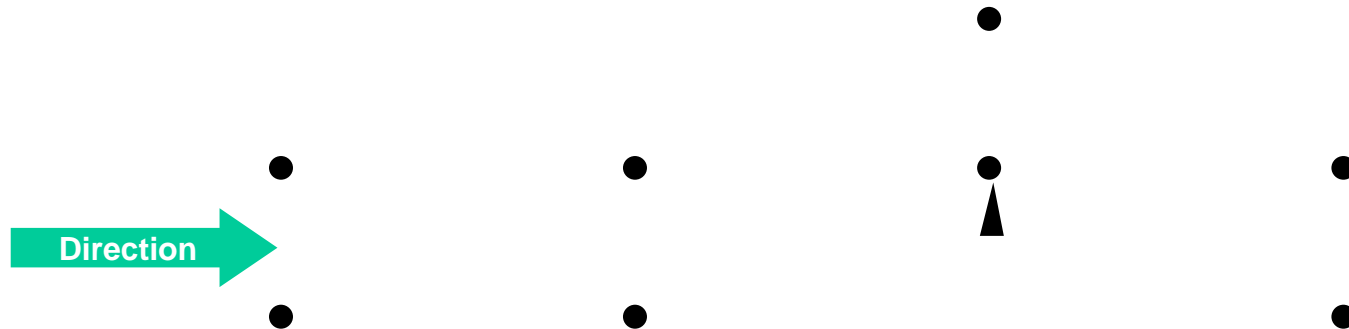
- **Do not place cones or gates at intervals similar to the width of gates being used**
 - **For example, do not place gates going around a sweeping turn 25' or 15' apart if all of your gates are 20' wide.**
 - **This creates a visual “Cone Hell” nightmare since, at speed, all openings appear to be about the same size. *Arrrrgh!!! Which is gap and which is gate?***
- **Make all cone walls dense enough so that at any angle, the gaps between them cannot be construed as a gate.**
- **When entering a “box” or “walled in” turn, place the cones that appear in the approach path closer together and more frequently, creating a wall in the driver’s line of sight.**

Course Layout (Cont'd)

Gated Courses

Ratio of gate width to gate spacing should be 1 to 3 or greater.

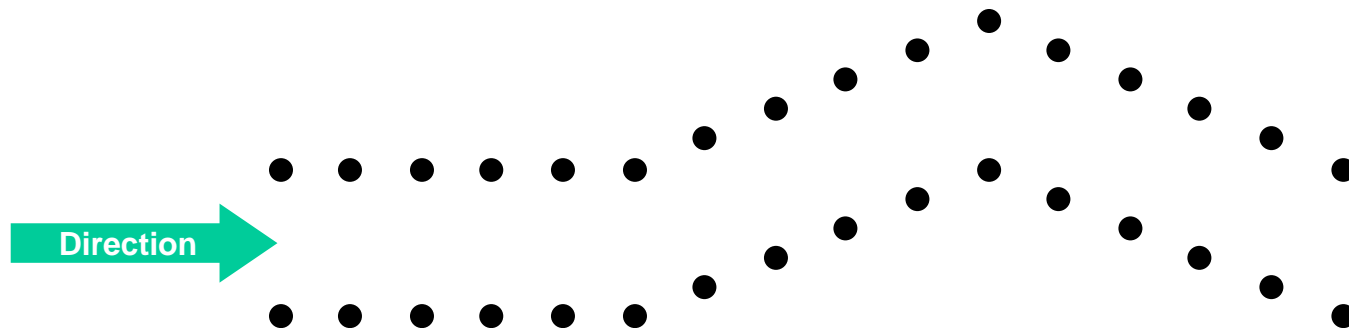
For example, if your gate width is 20 feet the distance between gates would be 60 feet or greater.



Miniature Road Courses

Ratio of gate width to gate spacing should be 2 to 1 or less.

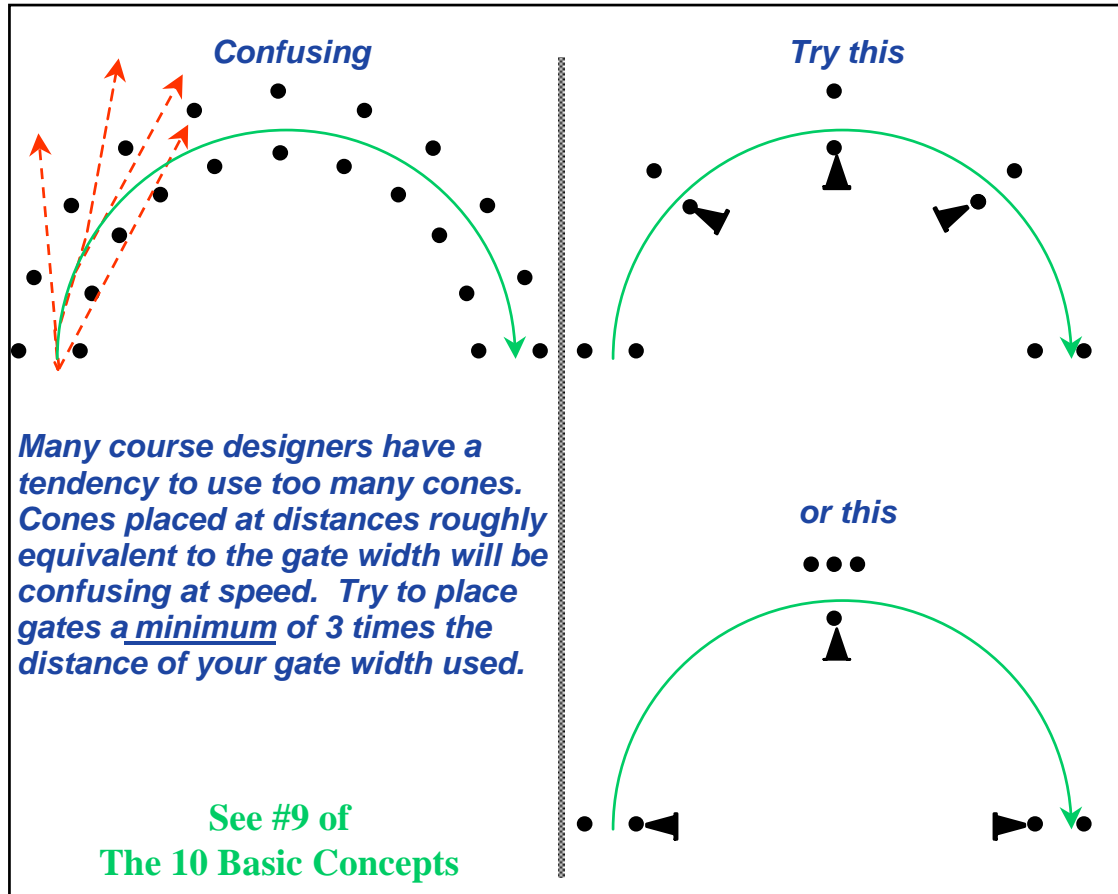
For example, if your gate width is 20 feet, the distance between gates would be 10 feet or less.



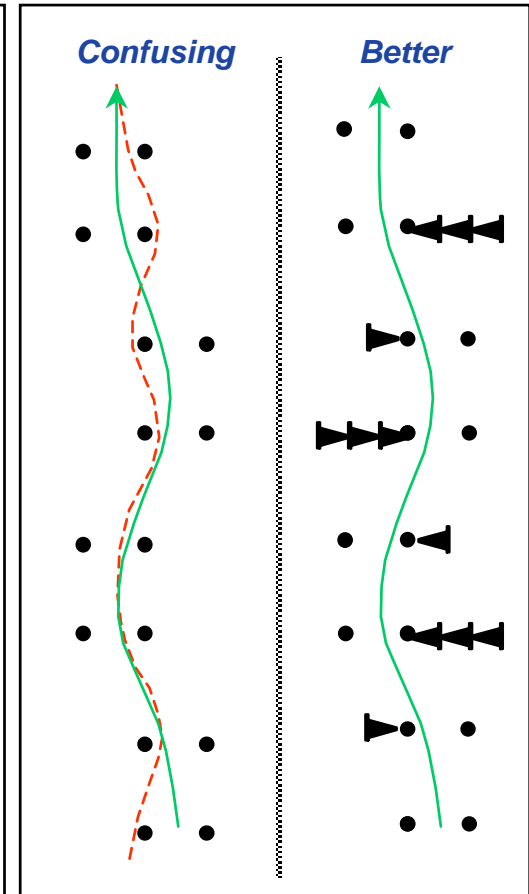
Course Layout (Cont'd)

Other examples that demonstrate the importance of gate spacing.

Sweeper

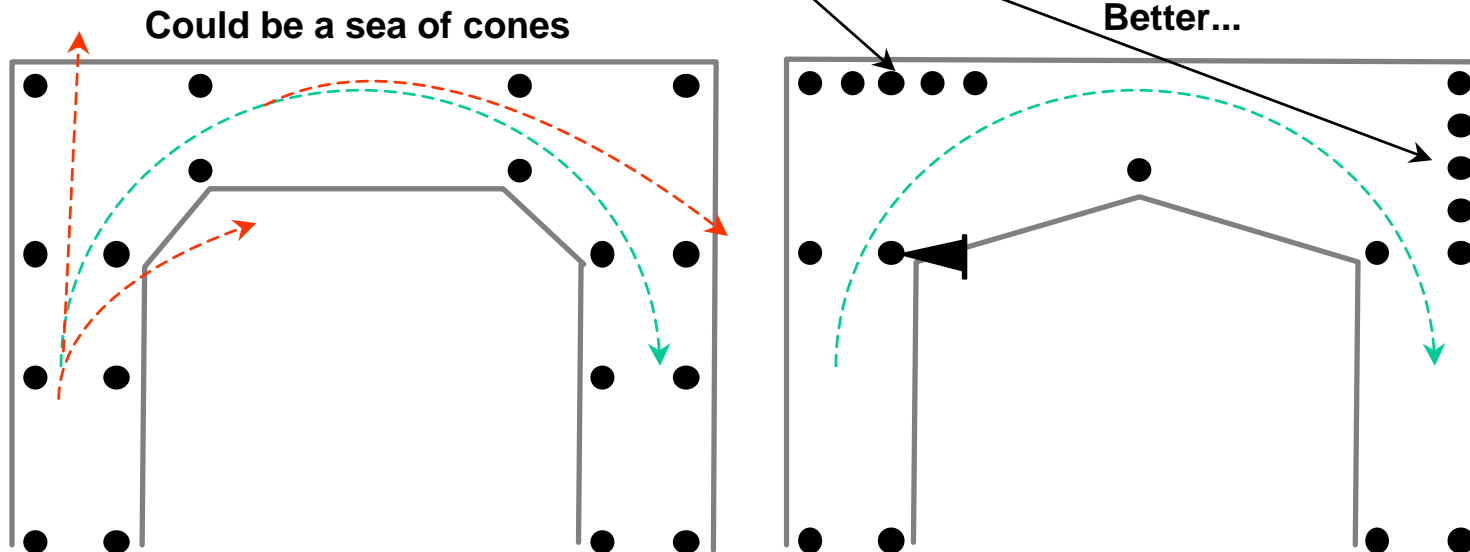


Lane Change



Course Layout (Cont'd)

When entering a “box” or “walled in” turn place the cones that appear in the approach path closer together and more frequently.



See #9 of
The 10 Basic Concepts

Common Sense (**Do Nots**)

Do Not Get them Lost!

- **DO NOT** put in lots of extra meaningless pylons just to disguise the course.
- **DO NOT** space pylons the same or similar distance as the gate width.
- **DO NOT** forget to line the course.

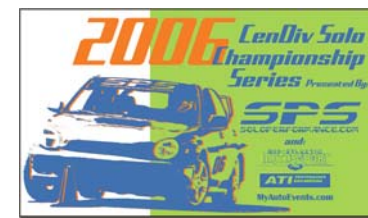
Do Not Make them Hit (and Pick Up) Lots of Pylons!!

- **DO NOT** place a cone with the only intent of “boy, will THAT one get creamed!”
- **DO NOT** end up with the effect known as the “Sea of Pylons.”

Course Layout - Getting Started

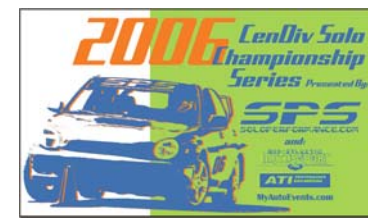
- **Position the Finish Area First**
 - Setup sufficient Runoff area.
 - Setup Exit from the Course area (tightly defined).
 - Setup route to Grid.
 - Locate Finish Timing Lights
 - To provide good Finish location.
 - To avoid impact by badly controlled cars.
 - Separation limited by equipment capability (how long is your cable?).
 - What type of Finish?
 - Flying Finish.
 - Finish after Turn.
 - Finish in a Turn.
 - Avoid maneuvers which encourage loss of control or requires heavy application of the brakes before the Finish lights or immediately after.
 - Ensure the T&S vehicle location will have a clear view of the finishing cars.

Course Layout Getting Started (Cont'd)



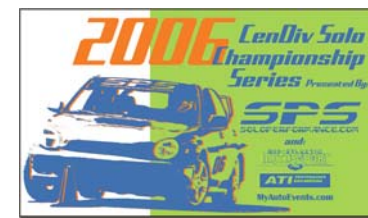
- **Position the Start Area Next**
 - **The Staging line.**
 - **Setup Access from the Grid.**
 - **Locate the Start lights**
 - **Provide a logical timing Start location.**
 - **Separation of the timing lights should be limited by equipment capability, not the Course's edge.**
 - **What kind of Start?**
 - **90°.**
 - **Turn before or after the timing lights.**
 - **Short approach.**
 - **Straight Shot.**
 - **Ensure that the T&S vehicle location will have a clear view of the starting cars.**

Course Layout Getting Started (Cont'd)



- **Determine number and directions of turns.**
- **Consider the location of the straight sections.**
- **Anticipate possible Course Worker Station positions.**
- **Keep in mind distance to boundaries and immovable objects.**
- **Allow for multiple cars on course if necessary**
 - Avoid crossovers.
 - Provide separation between adjacent sections.
- **Provide a variety of different types of maneuvers**
 - Make a list of the desired items for the Course.
 - Decide which portions of that route lend themselves to each of the listed elements.
- **Do several general sketches - there is no single “right” Course layout.**
- **Pick the ones that seem the best and fill them in**
 - Adjust turn radii and shapes.
 - Add transients where applicable.
 - Ensure a diversity of features.
- **Decide what your presentation format is and be consistent**
 - Gate style.
 - Walled style.
 - A combination thereof.

Course Layout Getting Started (Cont'd)



- **Now add the projected Course Worker Stations and projected coverage area**
 - **Keep coverage distances around 50 yards or less if possible.**
 - **Position near solid objects (protection) if possible/available**
 - **Light poles.**
 - **Trees.**
 - **Planters, Walls, etc.**
 - **Locate workers on the inside of a turn rather than the outside.**
 - **Anticipate possible directions that a car may spin and avoid those areas.**
 - **Prioritize closeness to the cones likely to be hit**
 - **Slalom cones.**
 - **Tight apexes.**
 - **Outside walls at ends of significant straights, etc.**
 - **Try to ensure that workers do not have to cross another area of the course to get to a down cone in their coverage area.**
 - **Try to keep workers out of areas where their backs will be toward on-coming cars.**

Summary & Acknowledgments

- **This presentation contains modified excerpts from the complete book by the author referenced below.**
- **The complete course design book is a compilation of the experiences of Karen Babb, Gregg Lee, Jim Garry, Team.Net and Roger H. Johnson.**
- **Remember, the more courses you design and set up, the better your courses will be.**

Please feel free to contact Roger or myself with any questions you may have.

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