SURFACE FRICTION SELECTION CHART

Read through each of the five categories below. These are the important topics to consider when choosing the proper ball surface friction for your style and lane condition. Simply circle the choice in each category that fits you. At the end, add up the five numbers and compare this sum to the chart at the bottom of the page. This chart is only a guide. You may have to fine tune the final surface texture, but this will provide you with a starting place. Having a trained pro shop technician assist you will pin-point the proper selection.

VARIABLE	POINTS
Lane Condition	
Heavy Oil	3
Medium Oil	2
Light Oil	1
Bowler's Ball Speed	
Faster	3
Average	2
Slower	1
Bowler's Revolutions	
Stroker (under 13)	3
Tweener (13 to 17)	2
Power (18+)	1
Bowler's Axis Rotation (hand position at release)	
90° (3:00 hand release)	3
45° (4:30 hand release)	2
10° (5:30-6:00 hand release)	1
Bowler's Axis Tilt (size of track)	
Maximum (Small-under 9 1/2")	3
Medium (Medium-9 1/2" to 11")	2
Minimal (Large-11 1/2" to 13 1/2")	1

Total Points and Recommended Surface Friction

15 points:	360-grit Abralon pad
14 points:	Powerhouse Sandblaster Polish
13 points:	500-grit Abralon Pad or 3M Burgundy Scuff Pad
12 points:	3M Gray Scuff Pad
11 points:	800-grit wet sandpaper
10 points:	1000-grit Abralon Pad or Powerhouse Matte Finish Polish
9 points:	500-grit Abralon Pad, followed by 2000-grit Abralon Pad
8 points:	1000-grit Abralon Pad, followed by 2000-grit Abralon Pad
7 points:	1000-grit Abralon Pad, followed by Powerhouse Factory Finish Polish
6 points:	1000-grit, then 2000-grit, then 4000-grit Abralon Pads
5 points:	1000-grit, then 2000-grit, then 4000-grit Pads, followed by Ebonite Powerhouse Extender Polish

— TRUE GRIT —

The most important decision for proper ball reaction

Having the proper amount of surface friction on the bowling ball's surface is the most important factor in obtaining a favorable ball reaction. Having too much (the ball is not smooth or shiny enough) or having too little (the ball is too smooth) can severely hinder your ball reaction. While it is very important to consider the proper RG (early rev versus late rev) and Differential (flare and hook potential) when picking out a new ball, having the proper relationship of friction between the ball's surface and the lane surface is paramount in maximizing ball reaction. It does not matter what size of engine a car has in it if the tires do not provide the proper contact with the road. One can vary the breakpoint greater with sandpaper and polishing compounds than with drilling techniques using different pin placements.

On the other side of this paper is a general guide for choosing the proper surface friction. I'd like to address two of the five categories: axis rotation and axis tilt.

Axis rotation is dictated by the bowler's hand position at the point of release. When the hand exits the ball between 5:30 and 6:00, the ball has an end-over-end roll. This release creates 0° to 10° axis rotation and has the least hook potential and the earliest roll (figure 1). When the hand exits the ball in the 4:30 area, the ball has a medium amount of side roll. This release creates 45° axis rotation, medium length, and is the most adaptable to many lane conditions (figure 2). Releasing the ball at a 3:00 hand position imparts maximum side roll. The ball revs at a 90° angle, has maximum skid, and a violent breakpoint (figure 3).

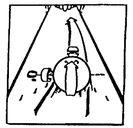

figure 1

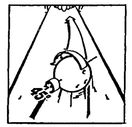

figure 2

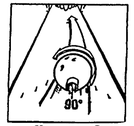

figure 3

The second subject is axis tilt. This is the vertical angle that the bowler's axis spins on. This is also determined by the release. By turning the hand too quickly, the thumb exits the thumbhole late. This causes the bowler to top the ball. The more the bowler tops the ball, the small that his/her track circumference will be. The small the track, the most vertical axis tilt. The more axis tilt present, the longer the ball will skid down the lane and the less hooking power it will have. More deflection will occur when the ball enters the pocket. Below, in figures 4, 5 and 6 is the method used to determine the track circumference. First, trace the bowler's track with a marking pencil. Using your quarter scale, draw a line (at a 90° angle across the track) from one side of the track to the other. Measure the half-way point and mark it with your pencil. Draw another line 90° to this line connecting both sides of the track. Measure the half-way point on this line. This is the negative axis point. All points of the track should be equidistant from this point. Measure the total distance from one side of the track to the other through the negative axis point. This is the track diameter.

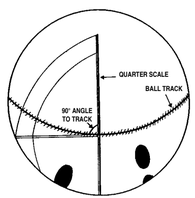

figure 4

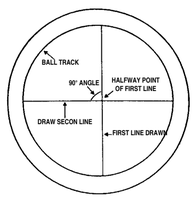

figure 5

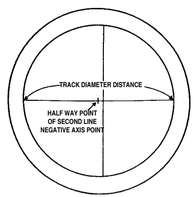

figure 6

SYMMETRIC CORE DYNAMIC LAYOUTS

These layouts are for right-handed drilling. Reverse the layout procedure (mirror image) for left-handed layouts.

These drilling patterns are alterations of the ball's dynamic fingerprint. The length, backend, and overall hook ratings are relative to the ball's potential. Drilling a low RG ball with a high RG pin placement (near the track) will not create as much length as you would receive from choosing a high RG ball. Drilling a high RG ball to get into an earlier roll will not be as effective in heavier oil a choosing a lower RG ball. A higher RG ball with require more surface friction to react well in heavier oil. A lower RG ball will require a shinier surface to navigate medium to lighter oil conditions. When the RG differential (flare potential) of the core is greater, the differences between the different layouts will be more pronounced. When drilling a ball that has a lower RG differential (flare potential) the differences between length, backend, and overall hook in different drilling patterns is not as significant. Please consult the Ebonite Ball Rating Matrix and catalog specs for the RG and RG differential ratings of our line of balls. The hook style listed for each ball is the description of the ball's transition from skid to roll to hook. Arcing balls are preferable on wet/dry patterns and flip reactions are preferable playing inside angles or blended lane conditions.

Choosing the correct combination of core dynamics and surface friction will be more important than choosing the correct dynamic layout. Matching the bowler's ball speed, axis rotation, axis tilt, and revolutions with the lane condition is the secret to great ball reaction. Consult Ebonite's Ball Selection Guide for assistance.

The heavy spot of the ball, (center of gravity), is signified by the letters **CG** in the drilling instructions. The center of the core is identified by the **PIN**. The **PAP** in the layouts is the bowler's positive axis point. If the bowler's **PAP** is not known, we suggest drilling #1, placing the CG in the center of the span with the pin at 1:30.

The following ratings are used:

Length: scale 1 to 10 with 1 being the earliest roll and 10 being the most length.
Backend: scale 1 to 10 with 1 being the least and 10 being the most.
Overall Hook: scale 1 to 20 with 1 being the least and 20 being the most.

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BOWL TO WIN™

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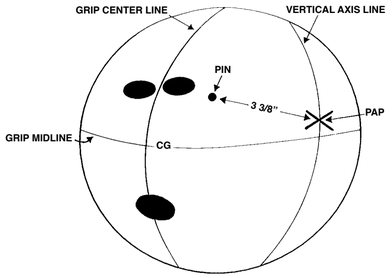
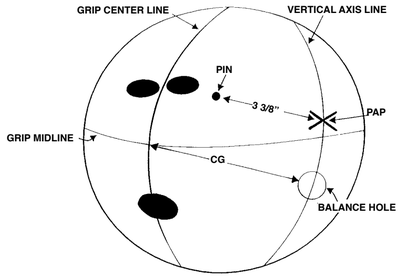


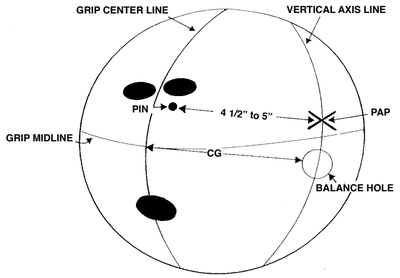
DRILLING #1 **LABEL LEVERAGE**

Ball Choice: pin out 1" to 4", all top weights
Reaction: *Length…5 Backend…7 Overall Hook…8*
Hook Style: *Medium hook, arc backend*
Lane Condition: Medium to heavy oil with a hooking track, fresher backends, great for slower ball speeds and minimal axis rotation.
Pin Placement: 3 3/8" from PAP (flare safe area) in a 1:30 direction from CG.
CG Placement: 4" to 5 1/2" from PAP.
Balance Hole: No balance hole needed.



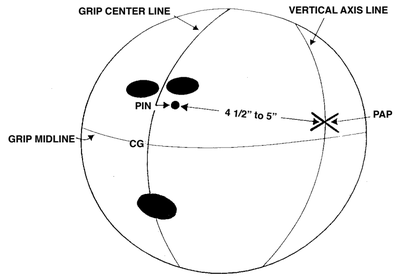
DRILLING #2 **12:00 LEVERAGE**

Ball Choice: pin out 1" to 4", all top weights
Reaction: *Length…3 Backend…10 Overall Hook…10*
Hook Style: *Maximum hook, sharp breakpoint*
Lane Condition: Medium to heavy oil blend, open up the lane.
Pin Placement: 3 3/8" from PAP (on a line from the PAP to the ring finger) in a 12:00 direction from CG.
CG Placement: 3" to 3 1/2" from PAP (location may be above or below the grip midline depending on the pin out distance).
Balance Hole: Place on a line from the grip center through the CG on the vertical axis line. Drill back to 1/2 positive.



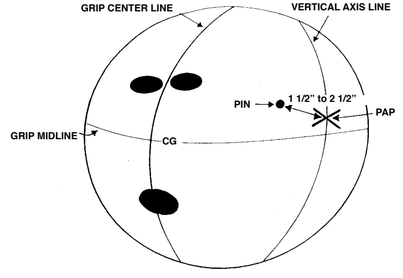
DRILLING #5 **MEDIUM RG - STRONG**

Ball Choice: pin out 1" to 4", all top weights
Reaction: *Length…6 Backend…9.5 Overall Hook…9*
Hook Style: *Large hook, sharp backend*
Lane Condition: Medium oil with carrydown, plays well inside of a defined oil line, great for medium to maximum axis rotation and above average ball speed.
Pin Placement: 4 1/2" to 5" from PAP below the ring finger in a 10:30 direction from the CG.
CG Placement: 3" from PAP (location may be above or below the grip midline depending on the pin out distance).
Balance Hole: Place on a line from the grip center through the CG on the vertical axis line. Drill back to 1/2 positive.



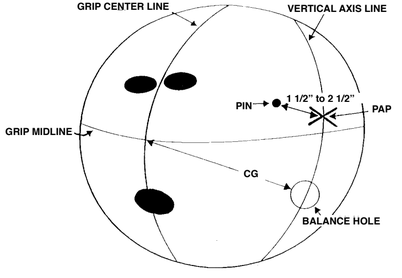
DRILLING #6 **MEDIUM RG - ARC**

Ball Choice: pin out 1" to 2", all top weights
Reaction: *Length…8 Backend…5 Overall Hook…6.5*
Hook Style: *Smallt o medium hook, arc*
Lane Condition: Light to medium oil with hooking ball track, wet/dry conditions, great for players with slower ball speed, minimal axis rotation, or stronger revs.
Pin Placement: 4 1/2" to 5" from PAP below the ring finger in a 1:30 direction from the CG.
CG Placement: 1/2 oz. negative side.
Balance Hole: No hole needed.



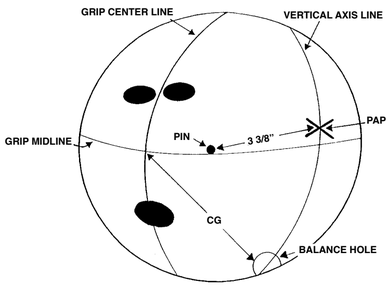
DRILLING #9 **LOW RG - ARC**

Ball Choice: pin out 2" to 4", all top weights
Reaction: *Length…4 Backend…4 Overall Hook…5*
Hook Style: *Small to medium hook, early revs, arc backend*
Lane Condition: Lighter oil, wet/dry conditions.
Pin Placement: 1 1/2" to 2 1/2" from PAP in a 2:00 direction from the CG.
CG Placement: 3 1/2" to 5" from PAP (direction depends on pin out distance).
Balance Hole: Place on PAP (if needed). Drill back to 1/2 positive.



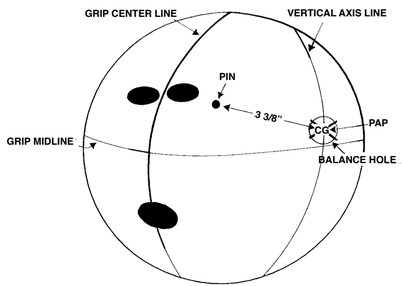
DRILLING #10 **LOW RG - STRONG**

Ball Choice: pin out 2" to 4", 1 1/2 to 2 1/2 oz. top weights
Reaction: *Length…3 Backend…6 Overall Hook…7*
Hook Style: *Small to medium hook, early revs, strong arc backend*
Lane Condition: Light to medium oil, wet/dry conditions, lower track players, faster speed, medium to maximum axis rotation.
Pin Placement: 1 1/2" to 2 1/2" from PAP in a 2:00 direction from the CG (on a line from the PAP on the ring finger).
CG Placement: 3 1/2" to 5" from PAP (location depends on pin out distance).
Balance Hole: Place on a line from the grip center through the CG on the vertical axis line. Drill back to 1/2 positive.



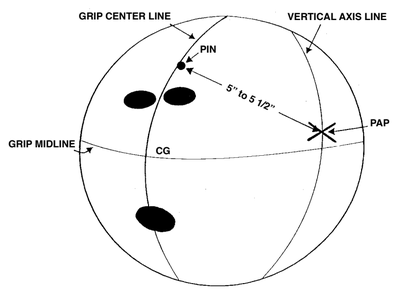
DRILLING #3 **REV LEVERAGE**

Ball Choice: pin out 2" to 4", up to 3 oz. top weight
Reaction: *Length…1 Backend…9 Overall Hook…9.5*
Hook Style: *Large hook, controlled backend*
Lane Condition: Medium to heavy oil with carrydown, good for players with low tracks, maximum axis rotation, and faster ball speeds.
Pin Placement: 3 3/8" from PAP slightly above the grip midline, in a 12:00 direction from CG.
CG Placement: 3" to 4" from PAP in the thumb positive quadrant (location depends on the pin out distance).
Balance Hole: 6" from the grip center on a line through the CG, drill back to 1/2 oz. negative side.



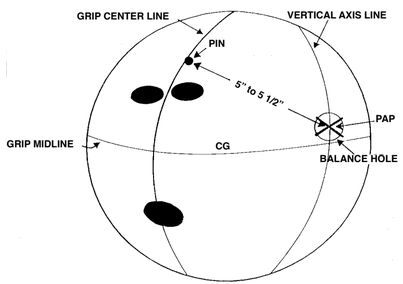
DRILLING #4 **AXIS LEVERAGE**

Ball Choice: pin out 2" to 4", 1.5 to 2.5 oz. top weights
Reaction: *Length…2 Backend…8.5 Overall Hook…8.5*
Hook Style: *Medium hook, controlled backend*
Lane Condition: Medium to heavy oil with fresher backends or spotty backends where predictable hook is most important.
Pin Placement: 3 3/8" from PAP (on a line from the PAP to the ring finger), in a 10:30 direction from the CG
CG Placement: on a line 0" to 1 1/2" from the PAP to the pin (location depends on the pin out distance).
Balance Hole: Place on PAP. Drill back to 1/2 oz. positive side.



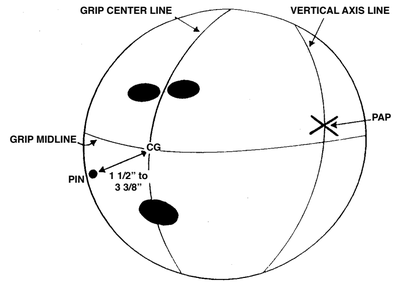
DRILLING #7 **HIGH RG - ARC**

Ball Choice: pin out 3" to 5", all top weights
Reaction: *Length…10 Backend…6 Overall Hook…6*
Hook Style: *Small to medium hook, late revs, arc*
Lane Condition: Light oil with hooking ball track, dry conditions, great for players with slower ball speed, minimal axis rotation, or stronger revs.
Pin Placement: 5" to 5 1/2" from PAP above fingers in a 12:00 direction from the CG.
CG Placement: 0 to 1/2 oz. positive side.
Balance Hole: No hole needed.



DRILLING #8 **HIGH RG - STRONG**

Ball Choice: pin out 3" to 6", all top weights
Reaction: *Length…9 Backend…8 Overall Hook…7.5*
Hook Style: *Small to medium hook, late revs, sharp backend*
Lane Condition: Lighter oil with carrydown, great for players with slower ball speed, medium axis rotation, or stronger revs.
Pin Placement: 5" to 5 1/2" from PAP above fingers in a 10:30 direction from the CG.
CG Placement: 2 1/2" to 3" from PAP (location may be above or below the grip midline depending on the pin out distance).
Balance Hole: Place on a line from the grip center through the CG on the vertical axis line. Drill back to 1/2 positive.



DRILLING #11 **FULL ROLLER**

Ball Choice: pin out 1 1/2" to 4", all top weights
Reaction: *3 3/8" from grip center*
Length…3 Backend…10 Overall Hook…10
Lane Condition: Medium to heavy oil, maximum hook.
Pin Placement: 3 3/8" from grip center in an 8:30 direction from the CG.
CG Placement: Near center of span (location will depend on pin out distance).
Balance Hole: If needed, place on negative axis point (8:30 direction from grip center).
Reaction: *1 1/2" from grip center*
Length…1 Backend…8 Overall Hook…8
Lane Condition: Medium oil with carrydown.
Pin Placement: 1 1/2" from grip center in an 8:30 direction from the CG.
CG Placement: Near the grip center (location will depend on pin out distance).
Balance Hole: If needed, on the Positive Axis Point to 1/2 oz. positive side.

Balance Holes

Balance Holes on the PAP will cause a ball to roll earlier. Ending with negative side weight will cause the ball to roll earlier than positive side weight and have a smoother hook style.

Balance holes past the PAP increase the flare potential of the ball. This will increase the amount of backend hook and change the hook style to a stronger flip. Ending with negative side weight will actually INCREASE flare and hook potential compared to ending with positive side weight for a balance hole that is past the PAP. The track may flare over a balance hole drilled past the PAP in a high flare ball. To be safe, place two pieces of thumb tape where you plan to drill a balance hole. If the track flares over the tape, placing the hole pasat the PAP is not flare safe.

Placing a balance hole along the vertical axis line in the thumb/positive quadrant will also increase flare and hook potential. This is the balance hole area that we designate REV-LEVERAGE. As you move away from the PAP along the vertical axis line, the balance hole gets into a stronger leverage position. The strongest position is between 3" and 4 1/2" from the PAP along the vertical axis line. Balance holes in this area cause the ball to rev up quicker in the pine area and have more forward roll in the backends. This is a great balance hole location for lower track players, medium to maximum axis rotation, above average ball speed, stroker to tweener revolutions and for most players on longer oil conditions where a controlled backend hook is desired. Almost any of the layouts can utilize the REV-LEVERAGE balance hole. Simply choose a larger pin out and place the CG in the thumb positive quadrant, starting with 1 to 1 1/2 oz. positive side and 1 to 1 1/2 oz. thumb weight before drilling. Ending with negative side weight after drilling the balance hole will INCREASE the flare and hook potential more and create an earlier breakpoint than ending with positive side weight.

In review:

Balance holes on the PAP cause earlier and smoother hook.
Balance holes past the PAP increase hook, flip and flare.
Balance holes in the REV-LEVERAGE area cause earlier and stronger hook, increased flare, with a controlled, forward roll backend.