TOPS 3: Tiered Oval Process - Version 3

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From my perspective, coaches must constantly strive to improve their skill and knowledge. If this evolutionary effort ceases, a coach will begin the progressively backward slide into mediocrity that I see too often. I take the obligation and responsibility of continuous improvement very seriously. Like all aspects of my professional coaching, I always strive to improve daily in fitting and bowling ball layout concepts in order to help individuals and teams reach a higher performance level. My professional journey to improve a bowler’s fit is a constant progression to aid bowlers in their ability to swing the bowling ball more easily and to improve their release fluidity. The ultimate goal is to achieve a fit which helps maximize energy transfer to the bowling ball.

Consistent with this process, I present TOPS 3 (Tiered Oval Process by Slowinski Version 3). As many readers know, my TOPS journey begin in 2010 and was first published in 2011. In preparation for the 2010 Central American and Caribbean Games, I trained the Bermuda National team. And, with their visit, the Tiered Oval Process was born when I had to find a fitting solution for one of the Bermuda National Team members. During the fitting evaluation, he presented with a very long thumb and a segment length below the knuckle which was both very long and significantly different in regard to front-to-back size at the tip of the thumb. This combination caused excessive...
bending of the thumb, impacting the swing and prohibiting a good release. The team went on to win a Bronze medal in Singles at the Central American and Caribbean Games, which was only their second medal in their history. They also finished fourth in singles.

The experience of helping this player started my journey of creating a tiered oval thumb hole. Clearly, a good standard fit is not adequate to prevent thumb bending due to the anatomical issue of the thumb shape and it is something that all bowlers face. With a bent thumb, a bowler will have unnecessary added tension in the swing and a delayed thumb exit on the release. I first wrote about this process of matching bowlers’ anatomical thumb shapes with their thumb holes more accurately in the May 2011 issue of Bowling This Month. This was my first effort to create an anatomically shaped thumb hole with a specific drilling process. As I wrote in Bowling This Month in May 2011:

> There has to be a better way, I thought to myself. There are many bowlers who didn’t have major thumb problems but they had thumb bruising or noticeable grip pressure in their swing and/or release. With this in mind, I experimented with a multi-tiered oval process. Specifically, I was interested in fitting bowlers by matching an oval to each unique segment of their thumb. Looking at most thumbs, you will see segments of different heights, top-to-bottom. With each distinct segment, I was able to accurately match-up an oval that would fit each segment of the thumb more precisely, leading to a customized thumb shape.

I knew the TOPS concept would work due to the immediate feedback I was receiving in the experimentation phase. And, as I articulated in the first TOPS article, it did immediately help improve a bowler’s release and helped eliminate thumb bruising of an Aruba national team member who had been suffering with this for five years. The bruising disappeared within one month. This was not surprising due to the elimination of excessive thumb bending which most often causes the bruising on the thumb.
Although the initial prospects of TOPS were great and consistent, as several bowlers continued with the initial tiered oval process design, some discomfort developed on the corner of the thumb where the bottom and top tiers intersected. The bottom tier edge was digging into the edge of the nail, especially on backside of the thumb on the oval cut side. My efforts to eliminate this edge led to TOPS 2. In the article introducing TOPS 2, I discussed the revision process that I developed:

> Initial reactions were very positive, with many bowlers feeling a freer swing as well as a cleaner release. Moreover, the TOPS process enabled others to eliminate burn marks on the thumb. Yet, with all the positives from the front to back, there was also the realization of potential discomfort where the larger tier met the smaller tier. With this reality, I was determined to modify the fitting and drilling process to accurately cut the bottom tier in a manner which would eliminate the discomfort of the side-to-side, on the bottom, while maintaining the value of the smaller front-to-back on the bottom. After much reflection and the creation of a detailed oval chart, I present the Tiered Oval Process 2 thumb process. TOPS 2 is a more anatomically correct shape of the thumb and will help bowlers improve their game, no matter what level they are performing.

With TOPS 2, I had good intentions and the process eliminated the irritation. But, I was slightly overzealous with the process and it became too complex for easy implementation. Accordingly, due to the number of steps and the mathematics involved, TOPS 2 was too complicated and caused many issues in both calculation and implementation. So, now, I introduce TOPS 3. In TOPS 3, I resolve both the complicated drilling process and reduce the mathematical steps. So, I am confident TOPS 3 will be the final revision which will provide the reduction of thumb bending while providing maximum comfort.

**Introducing TOPS 3**

With TOPS 3, the goal is to simplify the process of fitting and calculating the cuts but stay consistent with the construction of a bottom tier to greatly reduce thumb bending-induced grip pressure. Most importantly, to improve the fit, the goal is to cut the entire side-to-side width on the bottom tier at the same width of the top tier to produce a more comfortable thumb fit.
TOPS vs. TOPS 3 design: the TOPS 3 design uses a bottom tier oval width that is the same as the top tier’s oval width

This requires some simple calculation but will produce a tiered oval process thumb with a bottom tier which prevents knuckle bending while producing a thumb which exits cleaner and faster.

The TOPS 3 thumb measurements are most easily obtained using a caliper. Shown is an inexpensive dial caliper.

We will now get into the implementation details of a TOPS 3 thumb hole. We’ll start by describing the required measurements and simple calculations that must be done prior to drilling the hole. Next, we’ll describe the recommended process for actually making the cuts that create the TOPS 3 hole. Finally, we will work through a detailed example of measuring and calculating the necessary parameters of a TOPS 3 thumb hole for a hypothetical bowler.

TOPS 3 measurement and calculation process

The process of measuring the thumb and calculating the required parameters to drill a TOPS 3 thumb hole are described below. Note that “top tier” refers to the portion of the thumb closest to its base and “bottom tier” refers to the portion of the thumb closest to its tip. “Top” and “bottom” also refer to the corresponding portions of the thumb hole, with “top” referring to the portion closest to the ball’s surface and “bottom” referring to the portion closest to the bottom of the hole. The measurement and calculation steps are as follows:

1) Find the bowler’s oval angle (OA).

2) Measure the bowler’s top tier front-to-back dimension (TTF2B) with caliper.
3) Measure the bowler’s side-to-side dimension (TTS2S) with caliper. Note that this will be the measurement of the widest point of the thumb.

4) Measure the bowler’s bottom tier front-to-back dimension (BTF2B) with caliper.

5) Measure the length of the top tier (TTL) from the web at the thumb’s base to the halfway point between knuckle and nail.

6) Determine the pilot hole for both the top and bottom tiers by converting the front-to-back caliper measurements to appropriate drill bit sizes using the provided chart. For the top tier, add 1/32"; for the bottom tier, leave it unchanged. In both cases, be sure to round up to the next largest drill bit size.

7) Determine oval cut amount by subtracting the top tier front-to-back measurement (TTF2B) from the top tier side-to-side measurement (TTS2S). Using the provided oval cut table, convert the oval cut amount into horizontal (X) and vertical (Y) amounts. Round to the nearest drill bit size when looking up the cut amounts in the table.

8) A goal of TOPS 3 is for the bottom tier side-to-side dimension to be equal to the top tier side-to-side dimension. To accomplish this, we must determine the extra amount (over and above the top tier’s oval cut amount) that makes the bottom tier’s side-to-side dimension equal to the top tier’s side-to-side dimension. This extra amount is equal simply to the difference in the top tier and bottom tier pilot hole diameters. Convert this quantity to horizontal (X) and vertical (Y) dimensions using the oval cut table and then add these values to the top tier oval cut amounts. The resulting values are the total X and Y cut amounts needed to make the bottom tier oval width equal to the
9) Using all of the above values, make a TOPS 3 cut sheet that summarizes the oval cut data for both the bottom level and the top level. A blank TOPS 3 cut sheet is shown below.

**BOTTOM TIER: _____” PILOT HOLE**

<table>
<thead>
<tr>
<th>X (horizontal)</th>
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**TOP TIER: _____” PILOT HOLE, _____” DEEP**

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10) Make a sample TOPS3 thumb in an old used ball.

11) If any adjustments need to be made, be sure to recalculate the bottom tier cuts so they match the top tier side-to-side dimension.

**Basic TOPS 3 cut instructions**

With all the measurements and calculations now complete, it is time to make the cuts. The recommended steps for constructing the TOPS 3 thumb hole are outlined below:

1) Make the pilot cut for the bottom tier at full depth using the bottom tier pilot hole drill bit.

2) Make the oval cut on one side at full depth using the bottom tier pilot hole drill bit.

3) Make the oval cut on the other side at full depth using the bottom tier pilot hole drill bit.

4) Make the pilot cut for the top tier at the top tier depth using the top tier pilot hole drill bit.

5) Make the oval cut on one side at the top tier depth using the top tier pilot hole drill bit. If the bottom tier oval cut was done properly, this oval cut will not cut anything on the side because the
bottom tier side-to-side width will already equal the top tier side-to-side width (per Step 8 of the measurement process detailed above).

6) Make the oval cut on the other side at the top tier depth using the top tier pilot hole drill bit. Again, assuming that the bottom tier oval was cut properly, this oval cut will not cut anything on the side (per Step 8 above).

7) Smooth out the bottom tier edge on the nail side with a bevel knife and disc sander. The goal is to make the nail side bottom edge smooth so the nail doesn't catch when entering the hole. Be careful not to make the hole shape change during this smoothing process. This customization step is critical to the TOPS 3 process.

8) Finish the thumb hole with the appropriate bevel.

9) Consider making a thumb mold for future use. With a mold of the TOPS 3 thumb hole, reproduction is much easier.

A TOPS 3 example

We will now walk through a complete hypothetical example of how to calculate the values needed to drill a TOPS 3 thumb hole. In this example, thumb pitches of 1/4" lateral left and 1/8" reverse are used. Also, this example uses a top tier depth of 1 5/16". First, we'll summarize the necessary measurements:

- Oval angle: 39 degrees
- Top tier front-to-back (measured with caliper): 0.756"
- Top tier side-to-side (measured with caliper): 0.943"
- Bottom tier front-to-back (measured with caliper): 0.567"

The first required calculation is to find the top tier oval cut width, which is equal to the difference between the top tier side-to-side measurement and the top tier front-to-back measurement:

\[ \text{Top tier oval cut width} = 0.943" - 0.756" = 0.187" \]

For convenience in using the detailed oval chart, we will round the top tier oval cut width up to the nearest drill bit size, which is 3/16" (0.1875" = 3/16"). This allows us to look up the required horizontal and vertical cuts for this bowler's given oval angle of 39 degrees:

- X oval cut top tier (horizontal): 0.146"
- Y oval cut top tier (vertical): 0.118"
Since only half of the oval width will be cut on each side, we'll now compute the half cut widths by dividing the above full cut widths by two:

\[
\begin{align*}
\frac{1}{2} X \text{ oval cut top tier} & : 0.073'' \\
\frac{1}{2} Y \text{ oval cut top tier} & : 0.059''
\end{align*}
\]

Next, we compute the top tier pilot hole size. Recall from above that the top tier pilot hole size is simply the top tier front-to-back measurement plus \(1/32''\) (which is approximately \(0.0313''\)), rounded to the nearest drill bit size:

\[
\text{Top tier pilot hole size: } 0.756'' + 0.0313'' = 0.787''
\]

\[
\text{Top tier pilot hole drill bit: } 25/32'' \text{ (which is the closest drill bit size to 0.787'')}
\]

For the bottom tier, the pilot hole size is simply the the bottom tier front-to-back measurement, rounded up to the next drill bit size:

\[
\text{Bottom tier pilot hole size: } 37/64'' \text{ (which is the next drill bit size above 0.567'')}
\]

Now, we must compute the bottom tier oval cut width needed to make the bottom tier oval the same width as the top tier oval. The total bottom tier oval cut width needed to accomplish this is simply the top tier oval cut width plus the difference in the two pilot hole sizes:

\[
\text{Difference in pilot hole sizes: } 0.781'' - 0.578'' = 0.203'' \text{ (13/16'')}
\]

So, in this example, \(0.203''\) is the width adder that must be added to the top tier oval width to make the bottom tier oval have the same overall width. We'll now convert the \(0.203''\) width adder to horizontal and vertical cuts (using the 39 degree oval angle as before):

\[
\begin{align*}
X \text{ adder (horizontal)} & : 0.158'' \\
Y \text{ adder (vertical)} & : 0.128''
\end{align*}
\]

Therefore, the bottom tier total oval cuts are equal to

\[
\begin{align*}
X \text{ oval cut bottom tier (horizontal)} & : 0.146'' + 0.158'' = 0.304'' \\
Y \text{ oval cut bottom tier (vertical)} & : 0.118'' + 0.128'' = 0.246''
\end{align*}
\]

Finally, we divide the above cuts by two since half of the oval width is cut on each side of the hole:

\[
\begin{align*}
\frac{1}{2} X \text{ oval cut bottom tier} & : 0.152'' \\
\frac{1}{2} Y \text{ oval cut bottom tier} & : 0.123''
\end{align*}
\]
With the above oval cut widths calculated, we can now fill out the TOPS 3 cut sheet by adding / subtracting the half cut widths from the starting pitch values, as shown below.

**BOTTOM TIER: 37/64” PILOT HOLE**

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<tbody>
<tr>
<td>X (horizontal)</td>
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<td>-0.250”</td>
<td>-0.098”</td>
</tr>
<tr>
<td>Y (vertical)</td>
<td>-0.002”</td>
<td>-0.125”</td>
<td>-0.248”</td>
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**TOP TIER: 25/32” PILOT HOLE, 1 5/16” DEEP**

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</thead>
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<td>-0.323”</td>
<td>-0.250”</td>
<td>-0.177”</td>
</tr>
<tr>
<td>Y (vertical)</td>
<td>-0.066”</td>
<td>-0.125”</td>
<td>-0.184”</td>
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**Closing thoughts - a few caveats**

A TOPS thumb is a custom fit unlike any a bowler has experienced before. For most bowlers, they will love this feeling as it will provide an unprecedented level of comfort leading to an immediate improvement in swing and release.

Due to the previous level of thumb bending and subsequent abrasion, the reduction of abrasion and contact with the back of the hole will lead a player’s thumb to shrink. A re-evaluation should happen every two months to ensure that the fit matches the player’s current thumb. The change will likely only be in the top tier as the nail-side bottom tier experiences less change in size and will remain stable. Discuss this possibility with the bowler during the initial evaluation. The positive aspect will be a convergence to a normal size after approximately six months and a few adjustments.

Fitting for a TOPS thumb will require a more intensive time commitment. Schedule a one hour slot for fitting and drilling of a test thumb. This also provides time for an adjustment and re-drilling of a second or third test thumb. The more accurate and detailed that you are with this process the better.

**Resources**

The following resources will help make the TOPS 3 measurement and calculation process easier. The first two tables will assist you in converting caliper measurements to drill bit sizes and in
Drilling the initial TOPS 3 thumb hole into an old test ball is highly recommended. A TOPS 3 hole drilled into an interchangeable slug is also recommended.

computing horizontal and vertical cuts when making ovals. The third document is a TOPS 3 fitting worksheet that will allow you to record the various measurements and perform the necessary calculations.

- **Decimal to fraction conversion table** (for converting caliper measurements to drill bit sizes)
- **Detailed oval cut table** (for converting oval widths and angles to horizontal and vertical cuts)
- **TOPS 3 fitting worksheet**

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**About Joe Slowinski**

Joe Slowinski, a USBC Gold Coach, is currently on assignment in Europe. The Portland Maine native served as the Administrative and Men’s Head Coach at Webber International University and served for four years as a Master Teaching Professional at the Kegel Training Center. Slowinski is the former Director of Coaching and Coach Certification for the National Sports Council of Malaysia. Joe’s personal coaching website is [www.bowlingknowledge.info](http://www.bowlingknowledge.info).