4.5.3 How the system calculates the oval cut from your inputs

How the system calculates the oval cut from your inputs

> `4.5.3` oval

Once the four oval inputs — starting bit, oval width, oval degrees, and taper — have been entered into the spec sheet, Spectre Cloud calculates the drilling instructions needed to produce the finished oval hole. Rather than requiring the operator to work out the geometry manually, the system outputs a set of **x-axis and y-axis offset movements** that tell the driller exactly how to reposition the ball relative to the drill bit to elongate the pilot hole into the correct oval shape.

⚙ What the System Calculates

The starting pilot hole is round — drilled straight down to the starting bit diameter. The oval cuts extend that hole along the line defined by the oval degrees entry, opening it out to the full oval width. Spectre Cloud resolves the oval degrees angle into two linear components — horizontal (**x-axis**) and vertical (**y-axis**) — so the driller can execute the cuts using the drill press's standard lateral adjustment controls rather than needing a rotary fixture.

- The **x-axis value** is the horizontal distance the ball must be moved relative to the bit — left or right — to position the cut correctly along the oval degrees line.

- The **y-axis value** is the vertical distance the ball must be moved relative to the bit — forward or back — to complete the movement along the same line.
- Together, x and y define a straight line through the center of the pilot hole at exactly the angle specified by the oval degrees entry — the finished hole will be elongated along this line to the full oval width.
- Taper is factored into the depth profile of the cuts — the system accounts for how much wider the top of the hole needs to be than the bottom when generating the offset values.

In plain terms: The system is doing trigonometry on your behalf. You enter an angle (oval degrees) and a target width — Spectre Cloud converts those into the horizontal and vertical movements your drill press can actually execute.

How X and Y Relate to Oval Degrees

The relationship between the oval degrees angle and the x/y output values follows standard trigonometric decomposition. The oval width defines the total distance to travel along the oval degrees line; x and y are the horizontal and vertical components of that travel.

Oval degrees	Clock position	X component	Y component
`0°`	12:00	Zero — no horizontal movement needed	Full travel — all movement is vertical (toward/away from fingers)
`45°`	~1:30	Moderate horizontal movement	Equal to x — movement split evenly between axes
`90°`	3:00	Full travel — all movement is horizontal	Zero — no vertical movement needed
`135°`	~4:30	Moderate horizontal movement	Equal to x but in opposite vertical direction
`180°`	6:00	Zero — no horizontal movement needed	Full travel in opposite direction to 0°

Note: The x and y values output by Spectre Cloud are always positive distances paired with a direction indicator — the system tells you both how far to move and which way. Read both the value and the direction before making any drill press adjustment. *Verify with Spectre team: confirm how direction is indicated in the output — whether as +/− signs, labeled arrows, or explicit left/right/forward/back text labels.*

□□ How to Use the Calculated Output at the Drill Press

1. Drill the starting pilot hole straight down — no lateral movement, centered on the thumb hole position as marked on the ball.
2. Without removing the ball from the fixture, read the x and y offset values from the Spectre Cloud spec sheet output.
3. Move the ball along the **x-axis** by the specified distance in the specified direction.
4. Move the ball along the **y-axis** by the specified distance in the specified direction.
5. With the ball held at the offset position, make the oval cut — the bit will now remove material along the oval degrees line, elongating the pilot hole toward the full oval width.
6. Return the ball to center and make the mirror cut in the opposite direction along the same axis to complete the oval — the hole is now elongated symmetrically around the original pilot hole center.
7. Apply taper cuts as indicated — the system's taper calculation specifies how much additional material to remove at the surface relative to depth to match the bowler's thumb profile.

Verify with Spectre team: confirm whether the oval cut is made in two passes (one in each direction from center) or as a single continuous pass through center, and whether the taper instructions are output as a separate set of values or integrated into the main x/y offset sequence.

□□ Checking the Output Before Drilling

Before making any cuts, review the calculated x/y values against the inputs to confirm the output looks reasonable. This is a quick sanity check that catches data entry errors before they become drilling errors.

- □ If oval degrees is close to `0°` or `180°`, the x value should be close to zero and the y value should carry most of the travel — confirm this matches the output.
- □ If oval degrees is close to `90°`, the y value should be close to zero and x should carry most of the travel.
- □ If oval degrees is close to `45°` or `135°`, x and y should be approximately equal — confirm both values are similar in magnitude.
- □ The combined travel distance (the hypotenuse of x and y) should approximately equal half the difference between the oval width and the starting bit diameter — if it looks significantly larger or smaller, recheck the width and starting bit entries.

- If either x or y is zero when the oval degrees entry is between `10°` and `80°` (or between `100°` and `170°`), something has been entered incorrectly — a non-cardinal angle should always produce non-zero values on both axes.

Tips for Working with the Calculated Output

- Print or display the spec sheet at the drill press before beginning — having the x/y values visible throughout the drilling sequence prevents errors from misremembering a value mid-cut.
- Make small, controlled movements when repositioning the ball for oval cuts — drill press lateral adjustments on a ball fixture have little margin for overshoot.
- If your drill press uses a digital readout for lateral positioning, zero the readout after drilling the pilot hole so the x and y offsets can be dialed in directly from the Spectre Cloud output values.
- Do not estimate the x/y movements by eye — the precision of the oval depends on executing the calculated offsets accurately. A `1/32"` error in lateral positioning produces a visibly off-center oval.
- Do not skip the sanity check on the output values before cutting — a transposed oval degrees entry (e.g. `45°` entered as `54°`) produces x/y values that look plausible but will orient the oval incorrectly on the ball.

Related Sections

- 4.5.2 — Entering starting bit, oval width, oval degrees and taper
- 4.5.4 — Entering the span with an oval thumb
- 4.5.1 — Selecting "Oval" thumb hole on the spec sheet
- 4.4.4 — Entering vertical and lateral pitch for thumb
- Book 05 — Oval Calculator
- Book 06 — Drilling Your First Ball

Tip: The first time you drill an oval thumb hole using Spectre Cloud's calculated output, go slowly and check your positioning at each step. Once you have drilled a few oval thumbs using the x/y offset workflow, it becomes a fast and reliable part of the drilling sequence — but the first time deserves extra care.

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