Can Z hop cause stringing?

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Abstract. Yes. Prusa says a lower Lift Z improves stringing. Keep the hop low (Bambu Studio ships 0.4 mm) and lift on a slope, spiral or ramp instead of straight up.

Keywords: stringing, retraction, slicer-settings

1 Can Z hop cause stringing?

Yes. Prusa says lifting straight up before each travel and back down after it "could result in undesirable stringing, especially while using wider nozzles," and that a lower Lift Z improves stringing. Keep the hop low (Bambu Studio ships 0.4 mm) and switch to a sloped, spiral or ramping lift, which Bambu Lab and Prusa say reduce strings.

1.1 The number

Table 1. The number

Slicer and profile	Lift as shipped	What its maker says about stringing
Bambu Studio, Bambu Lab X1 Carbon, 0.4 mm standard nozzle	"Z hop when retract" 0.4 mm, "Z Hop Type" Auto. The Bambu PETG Basic profile switches the type to Spiral	Slope, spiral and auto lift "can effectively reduce oozing and stringing"
OrcaSlicer, field default	"Z-hop height" 0.4 mm, "Z-hop type" Slope at a 3° "Traveling angle"	"Using spiral lines to lift Z can prevent stringing"
PrusaSlicer, Prusa CORE One, 0.4 mm nozzle	"Use ramping lift" on: a 1° ramp up to a "Maximum ramping lift" of 1.5 mm with PETG, 0.6 mm with PLA	Ramping lift "helps reduce stringing"
PrusaSlicer, Original Prusa MK3.5, 0.4 mm nozzle	"Lift height" 0.2 mm, straight up	A lower Lift Z "will improve stringing"
UltiMaker Cura 5.13.0	"Z Hop When Retracted" off; "Z Hop Height" 1 mm once ticked (0.2 mm in Creality profiles), straight up	Its Z hop descriptions give clearance as the reason to hop; none mentions stringing

Profile values come from Bambu Studio v02.08.02.61, OrcaSlicer v2.4.2, PrusaSlicer 2.9.6 and Cura 5.13.0 at their release tags. The quotes come from the Bambu Lab Wiki's retraction guide, the OrcaSlicer setting tooltip, PrusaSlicer's tooltip and Prusa's stringing article.

1.2 Why does Z hop cause stringing?

Because the nozzle can keep leaking while it travels, and a straight lift starts right over the spot where it stopped printing. Bambu Lab's wiki blames travel stringing on heat and the pressure inside the nozzle, which push molten filament out even when the head is not extruding. Retraction lowers that pressure but does not always stop the leak.

OrcaSlicer's wiki describes a Normal lift: straight up as the nozzle retracts, straight down before printing resumes. Plastic still leaking from the tip stays stuck to the top surface, so the nozzle draws it up and then trails it along the travel as a string. Prusa's notes for PrusaSlicer 2.7 name this case: the old lift "could result in undesirable stringing, especially while using wider nozzles," so the new ramping lift raises the head "gradually during the travel."

1.3 Does Z hop height affect stringing?

Yes. Prusa's stringing article says a lower Lift Z improves stringing, but warns that turning lift off can let the nozzle hit the part. No maker publishes how much stringing changes with height, so test the trade-off on your own printer. Prusa's CORE One profiles for the 0.4 mm nozzle stop the ramp at 0.6 mm for PLA and 1.5 mm for PETG. Prusa does not say why. For a starting height, see what Z hop height to use.

1.4 How do you stop Z hop stringing without turning it off?

Change how and where it lifts before you lower it or give it up:

1. **Lift on a slope, spiral or ramp.** Bambu Studio: "Z Hop Type" Slope, Spiral or Auto (Spiral is the field default, Auto the X1 Carbon's). OrcaSlicer: "Z-hop type" Slope, Spiral or Auto, with "Traveling angle" (3° by default). PrusaSlicer: tick "Use ramping lift" under Travel lift (off by default, on in the CORE One and MK4S profiles). Cura 5.13.0 only lifts straight up. See which Z hop type to use.
2. **Lift only where the nozzle could hit something.** OrcaSlicer's "On surfaces" (All Surfaces by default) can limit it to Top Only, Bottom Only or Top and Bottom. Height limits confine it to a band: "Z hop lower boundary" and "Z hop upper boundary" in Bambu Studio, "Only lift Z above" and "Only lift Z below" in OrcaSlicer, "Only lift" Above Z and Below Z in PrusaSlicer. At 0, each limit is off.

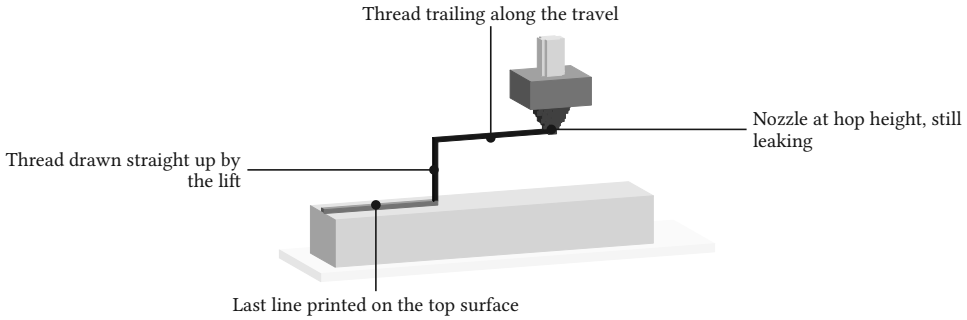


Figure 1. With a straight lift, the nozzle rises right above the spot where it stopped printing, so plastic still leaking from the tip is drawn up and along the travel as a string.

3. **In Cura, hop only over printed parts.** "Z Hop Only Over Printed Parts" (off by default) hops only when "Avoid Printed Parts When Traveling" cannot route around a part, which needs "Combing Mode" on. Cura's Creality profiles turn Combing Mode Off whenever Z hop is ticked, so set it back to "Not in Skin", their value with Z hop off.
4. **Lower the height.** "Z hop when retract" (Bambu Studio), "Z-hop height" (OrcaSlicer), "Lift height" or "Maximum ramping lift" (PrusaSlicer), "Z Hop Height" (Cura). Stop lowering once the nozzle scuffs top surfaces or catches curled edges.
5. **Wipe before the lift.** "Wipe while retracting" (Bambu Studio, OrcaSlicer, PrusaSlicer) moves the nozzle along the last path as it retracts to clean leaked plastic off the tip. The lift only starts after the retraction. It is on in the X1 Carbon profile with a 2 mm "Wipe Distance", off by default in OrcaSlicer, and on in Prusa's CORE One PETG profiles. Prusa's stringing article says to leave it on.
6. **Leave the travel threshold alone.** The nozzle only hops when it retracts, so raising "Travel distance threshold" (1 mm on the X1 Carbon), "Minimum travel after retraction" (1.5 mm on the CORE One) or Cura's "Retraction Minimum Travel" means fewer hops. But Prusa says a higher value increases oozing and stringing, and Bambu Lab says gaps too short to trigger a retraction get strings.

1.5 How to check it on your own print

1. **Find every place the hop is set.** Check the printer profile and the filament's Setting Overrides (Bambu Studio, OrcaSlicer) or Filament Overrides (PrusaSlicer). Bambu PETG Basic sets its own Z Hop Type, and Prusa's CORE One PLA and PETG profiles set their own ramp.
2. **Print the part that strings twice, changing only Z hop.** First with it off: height 0 in Bambu Studio and OrcaSlicer, "Use ramping lift" unticked and "Lift height" 0 in PrusaSlicer (filament overrides too), or "Z Hop When Retracted" unticked in Cura. Then as it was. Watch the first print: a scrape or knock means the part needs some hop.
3. **If the strings go away with Z hop off,** the hop was adding them. Turn it back on and apply the changes above one at a time, the lift type first.
4. **If the strings are the same either way,** the cause is elsewhere: retraction, temperature or damp filament (why prints string).
5. **Check the preview before printing.** With a sloped, spiral or ramping lift, travel moves climb at an angle instead of rising straight up from the last point.

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