How to seal 3D prints for a reptile enclosure

Asked 3D Content Team
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Abstract. Coat it in an epoxy its maker rates safe near reptiles and cure it fully. Bearded dragons bask at up to 42 °C (108 °F) and PLA softens at 57 °C: use PETG or ASA there.

Keywords: waterproofing, pla, petg, asa

Table 1. How hot each part of the enclosure gets

Species (source)	Basking zone	Cool end	Humidity
Bearded dragon (RSPCA)	38 to 42 °C (100 to 108 °F)	22 to 26 °C (72 to 79 °F)	30 to 40%
Bearded dragon (NC State Veterinary Hospital)	88 to 100 °F (31 to 38 °C)	Daytime air 75 to 85 °F (24 to 29 °C)	20 to 40%
Leopard gecko (RSPCA)	28 to 30 °C (82 to 86 °F)	24 to 26 °C (75 to 79 °F)	30 to 40%, plus a humid hide

1 How do you seal 3D prints for a reptile enclosure?

Brush on an epoxy whose maker calls it safe near reptiles, such as Smooth-On Habitat Cast N Coat, and let it cure fully. Then pick the plastic by heat: a bearded dragon's basking zone reaches 42 °C (108 °F), and PLA (polylactic acid) softens at 57 °C (135 °F), so use PETG or ASA there.

1.1 How hot each part of the enclosure gets

Figures come from the bearded dragon and leopard gecko care sheets of the RSPCA (Royal Society for the Prevention of Cruelty to Animals) and from the NC State Veterinary Hospital. Both put a rock right under the lamp, and the RSPCA sets the bearded dragon's thermostat probe at the level where the animal sits. A printed rock in that spot is the surface those figures describe and the hottest print in the enclosure.

1.2 Which plastic can go where

Plastic figures are from Bambu Lab's technical data sheets: heat deflection is the temperature at which a bar loaded at 0.45 MPa bends (ISO 75), Vicat softening the point where a loaded needle sinks in (ISO 306). The coating's figure is from Smooth-On's bulletin (ASTM D-648), which states no load. Prusa Research's knowledge base puts PLA's limit in plain words: it "gets soft and deforms at temperatures over 60 °C" (140 °F).

The margins decide it. Against a bearded dragon's 42 °C basking zone, PLA has 15 °C to spare, PETG 29 °C and ASA 58 °C. The coat itself has 13 °C, so sealing does not raise the heat limit. The plastic carries the animal's weight; the coat only covers the surface.

Thermostats are not always accurate, the RSPCA warns, and height eats margin too. Its bearded dragon sheet keeps the animal's back 25 to 30 cm (about 10 to 12 inches) from the lamp; a printed ledge that raises the animal also raises its own top toward the bulb.

Nothing printed goes on or around the lamp itself. The RSPCA requires a guard on every heat lamp. The Washington State University Veterinary Teaching Hospital says to put no glass, plastic or fine mesh between the bulb and the lizard, so do not print the shade or the guard.

1.3 Why seal a print that never holds water

Layer lines hold dirt. Prusa Research found that the gaps between printed layers "can become the breeding ground for the growth of bacteria and fungi." It was writing about prints that touch food, not enclosures, but the groove is the same.

The NC State Veterinary Hospital tells keepers to remove "soiled or wet portions of the substrate to prevent bacterial and fungal growth." Nobody can scoop waste out of a layer

Table 2. Which plastic can go where

Material (data sheet)	Heat deflection	Vicat softening	Where it can go	Source
PLA, Bambu Lab PLA Basic	57 °C (135 °F)	57 °C (135 °F)	Cool end; a leopard gecko's hot end. Not a bearded dragon's basking zone	Bambu Lab data sheet V3.0
PETG (glycol-modified polyethylene terephthalate), Bambu Lab PETG Basic	71 °C (160 °F)	69 °C (156 °F)	Anywhere under the lamp, basking zone included	Bambu Lab data sheet V3.0
ASA (acrylonitrile styrene acrylate), Bambu Lab ASA	100 °C (212 °F)	106 °C (223 °F)	Anywhere under the lamp, with the widest margin	Bambu Lab data sheet V3.0
Smooth-On Habitat Cast N Coat (the coating)	55 °C (131 °F)	Not listed	Over any of the above; its own limit is the lowest here	Smooth-On technical bulletin

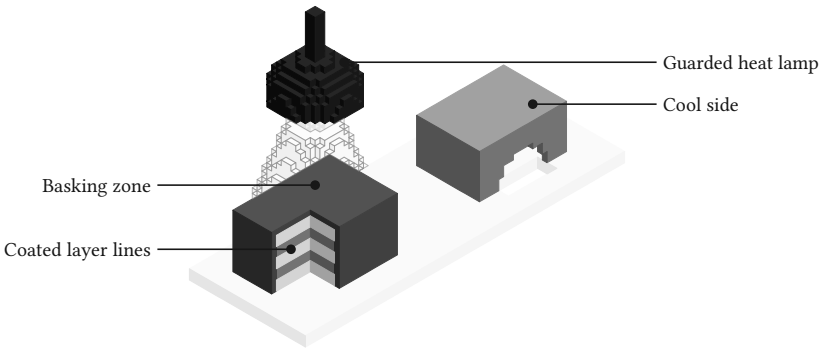


Figure 1. The rock under the lamp is the hottest print in the enclosure, so it is the one to print in PETG or ASA, coated over every layer line.

line. Prusa's fix is a coating that leaves the surface "consistent, smooth, and easily washable."

Humidity sets how hard the coat has to work. The RSPCA keeps bearded dragons and leopard geckos at 30 to 40%, but its leopard gecko humid hide has a waterproof bottom holding damp moss, sprayed every few days. Before coating that floor, print it with the walls from how many perimeters make a print watertight. Rainforest species run wet everywhere: the Merck Veterinary Manual lists 80 to 90% humidity for water dragons and 70 to 95% for boa constrictors.

Water does not pick the plastic. Bambu Lab lists saturated water absorption of 0.43% for PLA Basic and 0.45% for both PETG Basic and ASA, at 25 °C and 55% relative humidity. Heat does the sorting. Warm water also shortens PLA's life; the figures are on how long PLA lasts in water.

1.4 Sealing it, step by step

1. **Print each part for its zone**, from the table above.
2. **Test the epoxy on a scrap print.** Smooth-On says Habitat Cast N Coat is "safe for making elements used in proximity to animals/reptiles and aquatic life" and bonds to "many metals, plastics and foams". It does not name PLA, PETG or ASA, and it recommends a small test application.
3. **Mix it safely.** Stir 1 part A to 1 part B by volume for at least 3 minutes. Work in a ventilated room, in safety glasses and nitrile or vinyl gloves; you have 85 minutes of working time. For vertical faces, thicken it with Smooth-On's Folding Powder and apply it with a chip brush.
4. **Coat every face**: the underside, the inside of hides and the floor of a humid hide.
5. **Cure it at room temperature.** It cures in 16 hours, and Smooth-On measured its figures after 7 days at 73 °F (23 °C). On PLA, skip Smooth-On's heat cure at 150 °F (60 °C): that is above PLA's 57 °C softening point. Prusa Research warns that under-cured epoxy "might become toxic".
6. **Run the enclosure for at least a week before the animal goes in.** Both RSPCA care sheets ask for that week to adjust heating, lighting and humidity. It also leaves time for the checks below.

Pond Armor calls its Pond Shield epoxy safe for fish and aquatic plants once fully cured but names no reptiles. It and the brush-on method for water-filled parts are on the aquarium sealing page.

1.5 How to check it in your enclosure

1. **Heat.** Late in the lamp's daily on-period, aim an infrared thermometer at the print's top and at the side facing the lamp. The RSPCA uses the same tool for its daily basking-zone check. A reading above your species' basking range means the lamp needs adjusting. Reprint a PLA part in PETG or ASA if it reads anywhere inside a bearded dragon's basking range.
2. **Tack.** Press a gloved finger on every coated face, undersides included. Any tacky spot means the epoxy has not cured; give it more time before the animal goes in.
3. **A week of humidity.** Lift each part from the humid hide or a rainforest setup and look at its edges and underside. Whitening, soft spots or a coat lifting at a corner means water got under it. Strip it, sand and recoat, or reprint the part.
4. **Cleaning.** Follow your vet's or the enclosure maker's cleaning guidance, then check the coat for scratches. A scratch through the coat reopens the layer lines.

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