

Rainwater Isotopic Sampler Bag Connection  
Designed and Printed by the OPEnS Lab at Oregon State University  
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## Summary

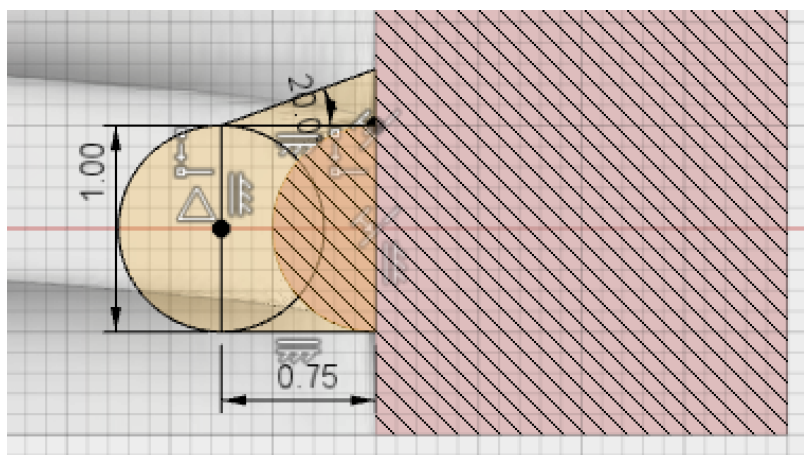
A watertight junction was needed between the aluminum-lined bags, used for storing the collected rainwater from the system, and a 1/8 NPT threaded fitting. A 3D printed design using two separate parts was made in both ABS and HIPS thermoplastics with adequate results. The two parts utilize the threads on the outside of the bag's mouth to press an o-ring to seal the connection.

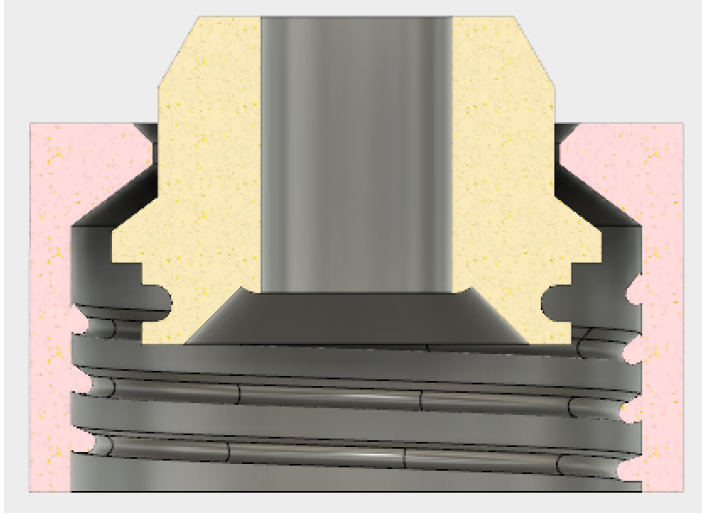
## Design Process

The thread spacing, thickness, and length were measured with calipers. In Autodesk Fusion360, a helix was created based on the measured dimensions. A closed profile (*Figure 1*) of a circle offset from a rectangle with a 20-degree angle wedge on the top of the rectangle was swept along the curve of intersection between the helix and the wall of the cap. This didn't produce the desired feature since the sweep angled the profile increasingly along the path. Regardless, the design was printed and functioned as desired, screwing overtop the mouth of the bag and pressing the inner piece (*see Figure 2*) to form a seal. Both pieces are designed to be printed upside-down, incorporating chamfers and angled-walls to reduce low-layer warping on the print bed and to allow printing without supports.

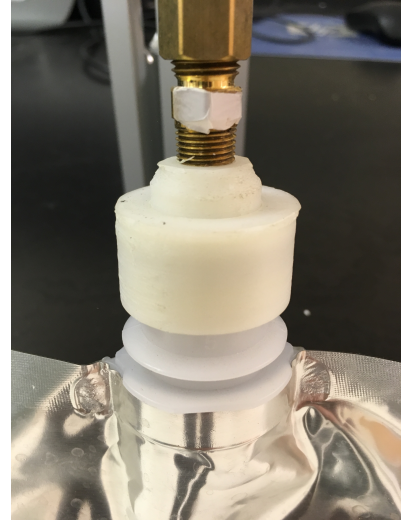
The inner piece has a lip that catches on the edge of the bag's mouth. A section fits into the mouth and an O-ring placed in the groove of this section seals against the inside of the mouth. This could be replaced by an O-ring set against the lip of the inner piece that presses against the edge of the bag mouth.

(Figure 1) Profile that was swept around the helix to form the threads of the cap.





(Figure 2) Side profile of the two pieces of the cap, with the outer and inner pieces in pink and yellow, respectively.



(Figure 3) The bag cap (center) printed in HIPS, attached to the aluminum-lined bag (bottom) and 1/8 NPT fitting (top).

## Conclusion

The design was printed in durable ABS and HIPS dozens of times successfully. Under limited use so far, the part seems to experience minimal wear if any. In practice, both pieces are difficult to break or damage beyond usability. Both the fitting and the bag mouth connect to their respective ends of each piece reliably. When printing, no supports or post processing are necessary for either piece oriented upside down. Future designs might allow the copper tube to be melted or glued directly on or into the inner piece, bypassing the need for a 1/8 NPT fitting. The threads might be remade combining separate square and circular helixes.