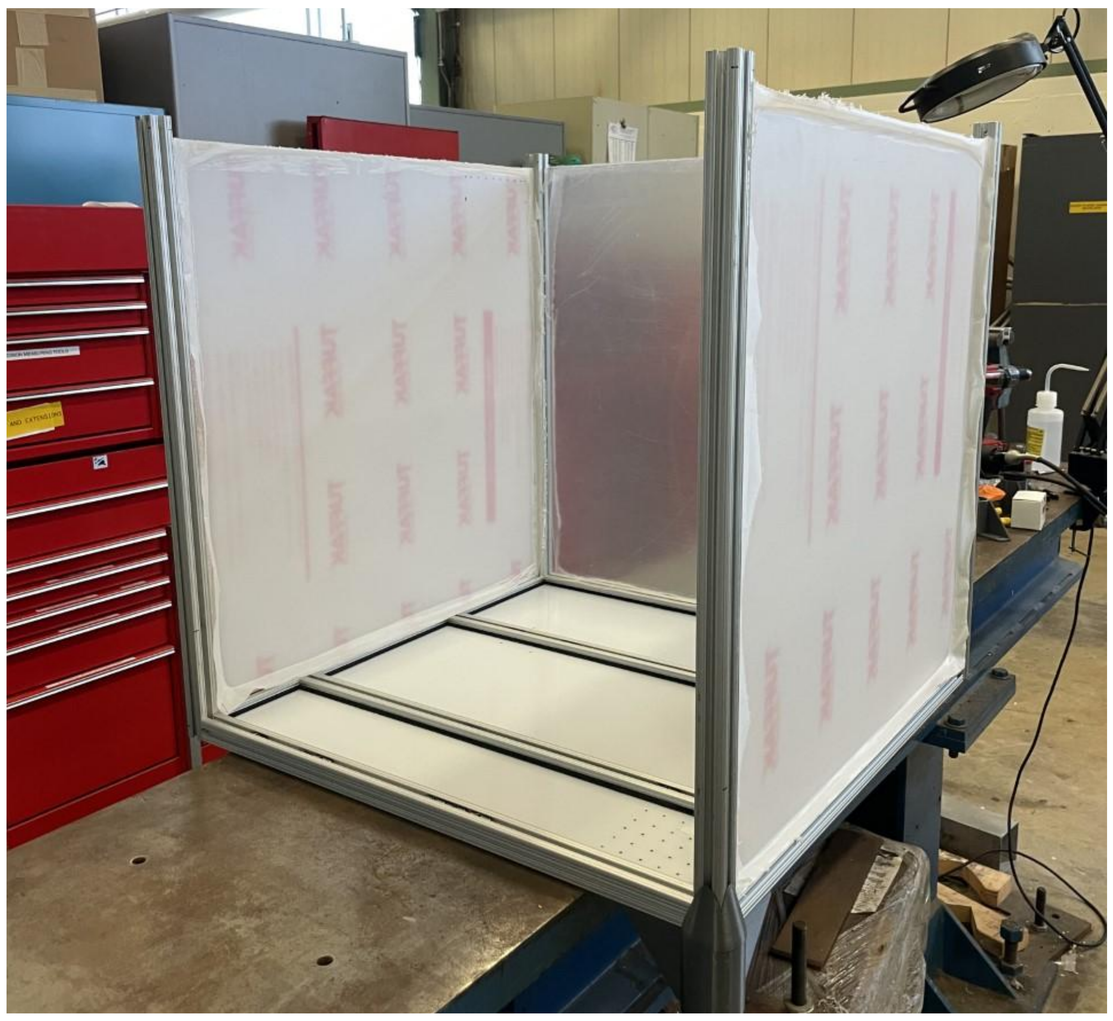
FERMILAB-POSTER-21-083-STUDENT

AD Robotics - 3D Printer Enclosure

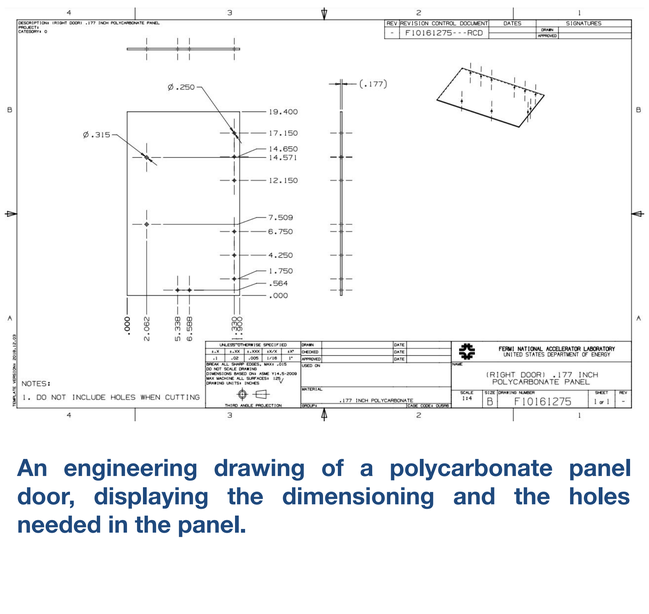
Magdalena Sarna under the mentorship of Noah Curfman

The Secure Solution to the Warping Issue

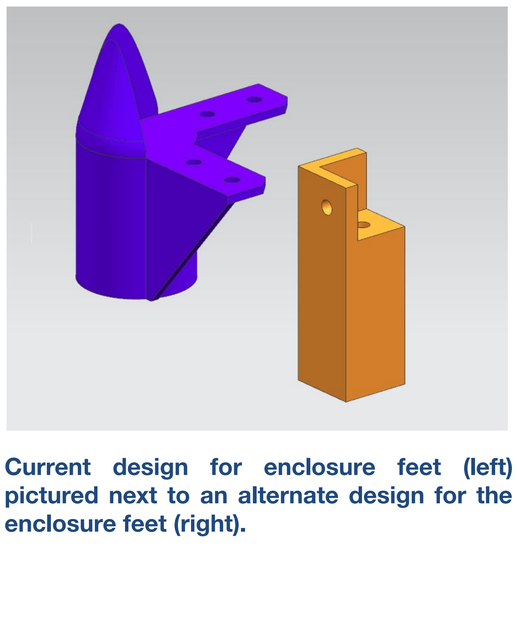


In this image, the progress of the final product is shown. The enclosure is built by the Magdalena Sarna and Emily Stachowicz under the guidance of the mentor, Noah Curfman.

In order to prevent failed 3D prints, an enclosure must be built for the 3D printer. By doing so, a proper temperature can be maintained to prevent premature curing of the printer filament by having an exhaust fan regulate temperature. Along with this, strategically placed vent holes and secure paneling prevent disruptive air currents from shifting the filament while it is being extruded. Finally, the casing acts as a shield from oncoming debris. With a combination of these aspects, prints can be safely produced without interruption or failure. This enclosure also includes convenient quality of life improvements such as an external control panel and attachments for future customizability.

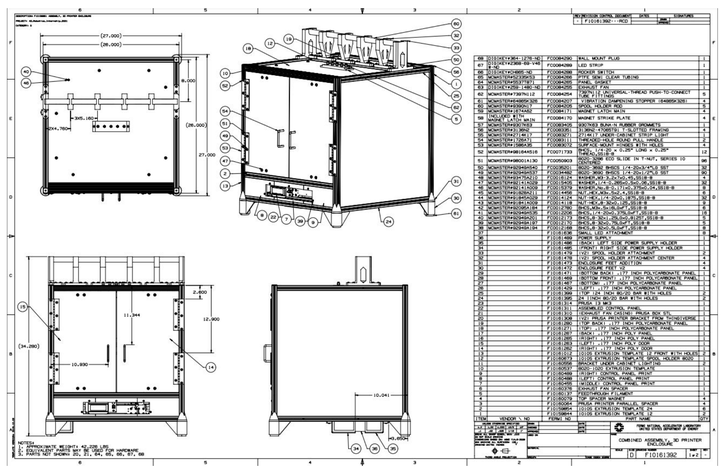


An engineering drawing of a polycarbonate panel door, displaying the dimensioning and the holes needed in the panel.

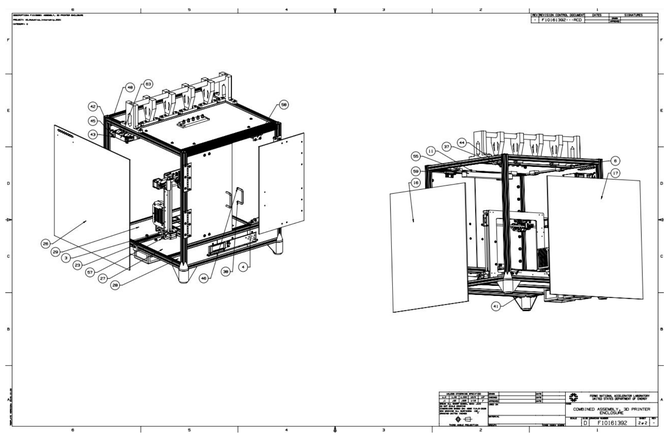


Current design for enclosure feet (left) pictured next to an alternate design for the enclosure feet (right).

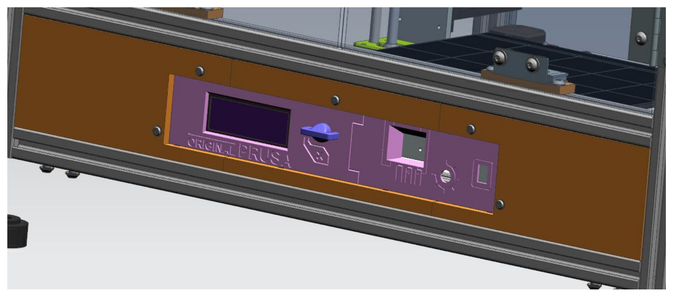
The Print to the Final Product



The engineering drawings shown display the top, front, side, isometric views, parts list, and labels of the final assembly enclosure.



These engineering drawings of the 3D printer enclosure show exploded views of the final assembly and label inside components.



Here, we can see custom 3D printed attachment hardware being used to connect “PrusaBox” components to 80/20.

To bring ideas into a physical product, the first step was to sketch out a few initial concepts. Once those were finalized, the next step was to begin creating an outer frame using 80/20 aluminum extrusions. From there, polycarbonate and high density polyethylene panels were added to shield the printer. With the main structure intact, custom parts were added, allowing for the combination of premade parts to commercial parts. These custom parts vary from the feet of the enclosure, to the prusa control system panel. To finish up the model, hardware was added. With two main iterations completed, the best ideas from both models were combined into one. Finally, with a polished model, engineering drawings were made and a bill of materials was compiled. Once all of the parts were received, a finished enclosure was subsequently built and implemented at FNAL.

This Project Does Not End Here

Repeatedly working towards the elimination of failed 3D prints can be achieved through the implementation of properly designed solutions, such as through the utilization of a 3D printer enclosure. This newly considered addition would increase the facility’s overall efficiency and cost-effectiveness. Science is a fast moving field, requiring the most streamlined of solutions and prototypes. The inclusion of a stable 3D printing environment would greatly aid in the effectiveness of Fermi National Accelerator Laboratory’s work.

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