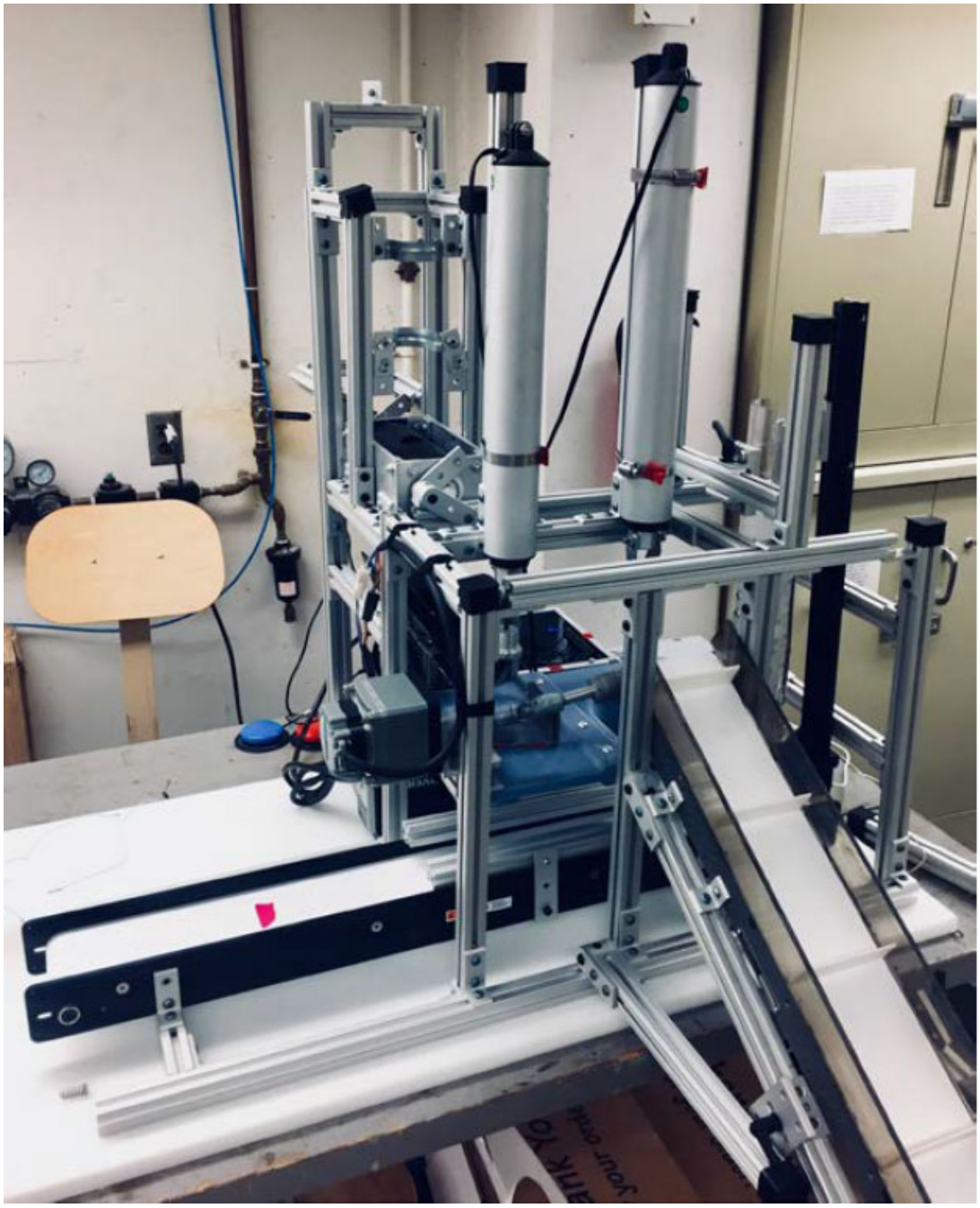
This brief summary provides some basic information about the 2017-2018 project attempts.

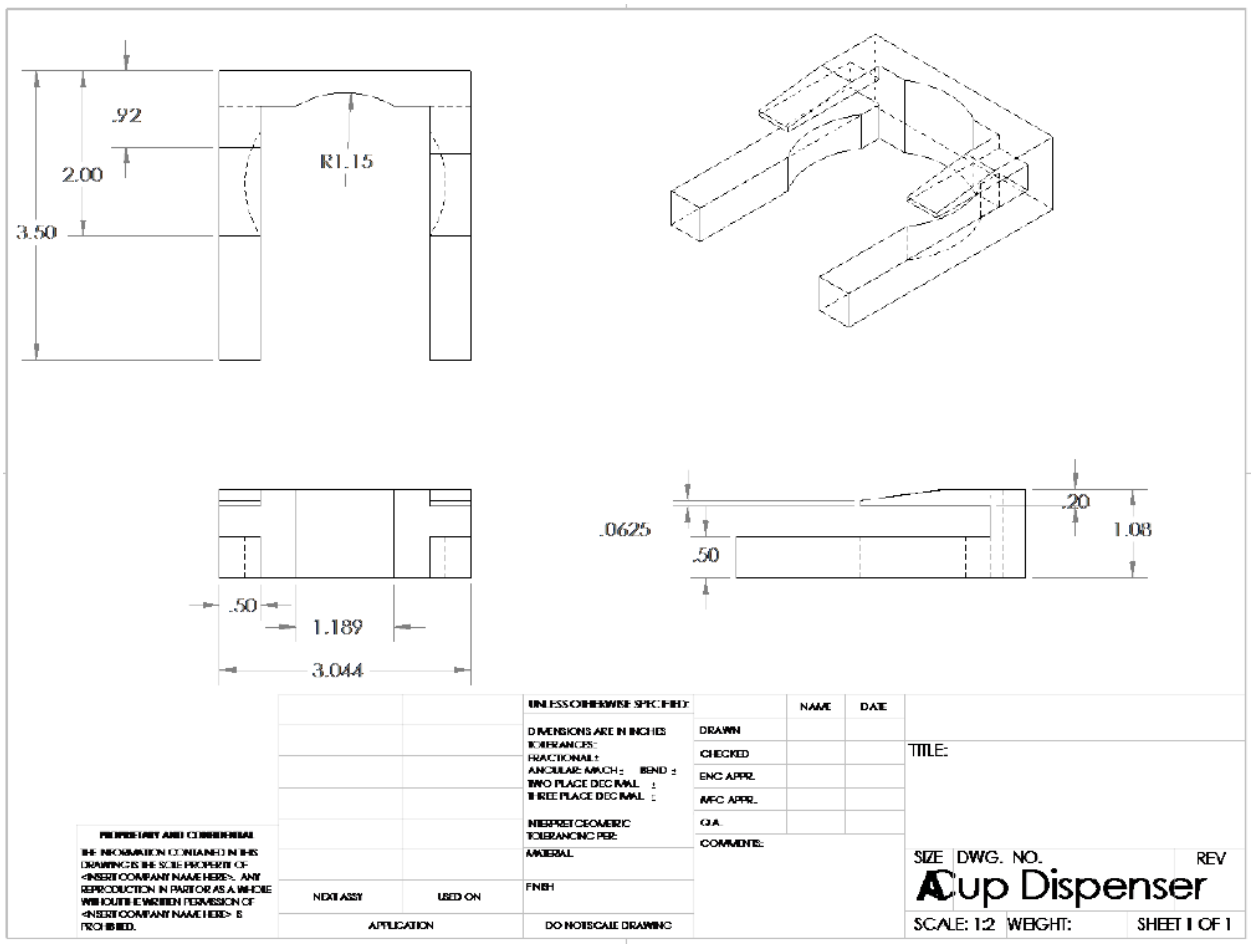
BREAK: Semi-Automatic Packaging System for Johnson County Developmental Supports

For this project year, the third team attempted to make the packaging system reliable enough for use by a worker at Johnson County Developmental Supports. The system is meant to dispense cups, stuff two gloves from the conveyor into the cup and insert/stuff a syringe "hub" into the cup with the gloves. The operator loads two gloves on the conveyor and pushes a button to advance the system.

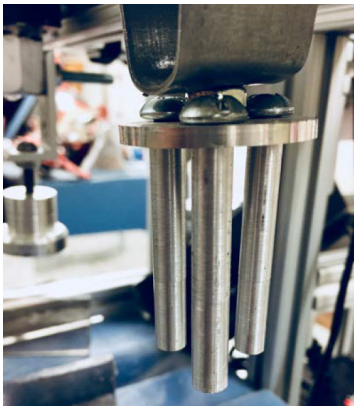


The prior year's team found that cup dropping was somewhat unreliable, in that too frequently no cup would dispense or two cups would dispense together. Also, the hub feeding system (funnel) would frequently jam, making dispensing hubs very unreliable. Finally, the glove/hub stuffing was quite inconsistent, sometimes allowing the gloves to come out and sometimes resulting in a cup falling over (such that the hub could not be inserted at all). The team focused on improving three aspects of the system that were unreliable: 1) cup dispensing, 2) glove stuffing, 3) hub sorting (along with dispensing/stuffing)

For cup dispensing the changed from a pusher system that advanced the cup stack a fixed amount to a system that "shears off" one cup from the bottom of the stack at a time (see drawing). This was much more reliable though adjustment proved to be more critical than first thought, so that only one cup would be dispensed. This system approached the reliability of less than one failure in 100 operations, though the team was shooting for less than one failure in 1000 operations for individual subsystems.



The team changed the stuffing subsystem from a three-pronged end-effector (left) to solid piece end-effectors (right), and found that the round one slightly small than the bottom of the cup was most reliable. While this system was greatly improved, it did not attain less than one failure in 100 operations.



To take bulk hubs (dumped into a hopper) and reliable dispense them one at a time, the team turned to a centrifugal sweeping system (early prototype below). This would sweep hubs to the outside and eject them through a chute (you can see the edge of the chute on the right). This quickly and efficiently dispensed hubs with high reliability. There were few failures, all of which were due to hubs trapped sideways against the exit chute. This was a great improvement, but mounting and precision construction limited the ultimate reliability. With further work, this basic concept could be much more successful.

In the end, the overall system still did NOT meet the level of reliability needed to be deployed at Johnson County Developmental Supports. Unfortunately, the project was discontinued, because Johnson County Developmental Supports lost their fulfillment contract for this particular project.