Examples of Good Design Portfolio Content

The content on the following pages has been extracted from portfolios submitted at a number of different fluid power challenges. These examples fully or almost fully meet the requirements for the *Design Portfolio* as detailed in the Challenge Rubric.

V1 – 2019 01 13

Criteria for success

In this competition of course you want to be successful, but the keys to success depend more on teamwork and co-operation instead of individual intelligence.

The keys/criteria for success are the following

- work as a team and use people for their individual skill sets.
- have a well thought out design. Simple is better.
- collaborate with your team to increase your time management and efficiency.
- have a clear understanding of your machines capabilities, flaws etc.
- strive for excellence
- have an organized plan
- have a sturdy base structure
- try not to put too much pressure on 1 syringe

In the creation of Glenview's prototype teamwork played a huge role in completing the finished machine, because as a team we all cheered each other up when stuff was going wrong, we had an assembly line type circuit with someone cutting and measuring, two people gluing, and someone else working the machine and inspecting it for little flaws to correct. Also we kept very organized an example of this is when we divided the portfolio up so that everyone had an equal share/ part.

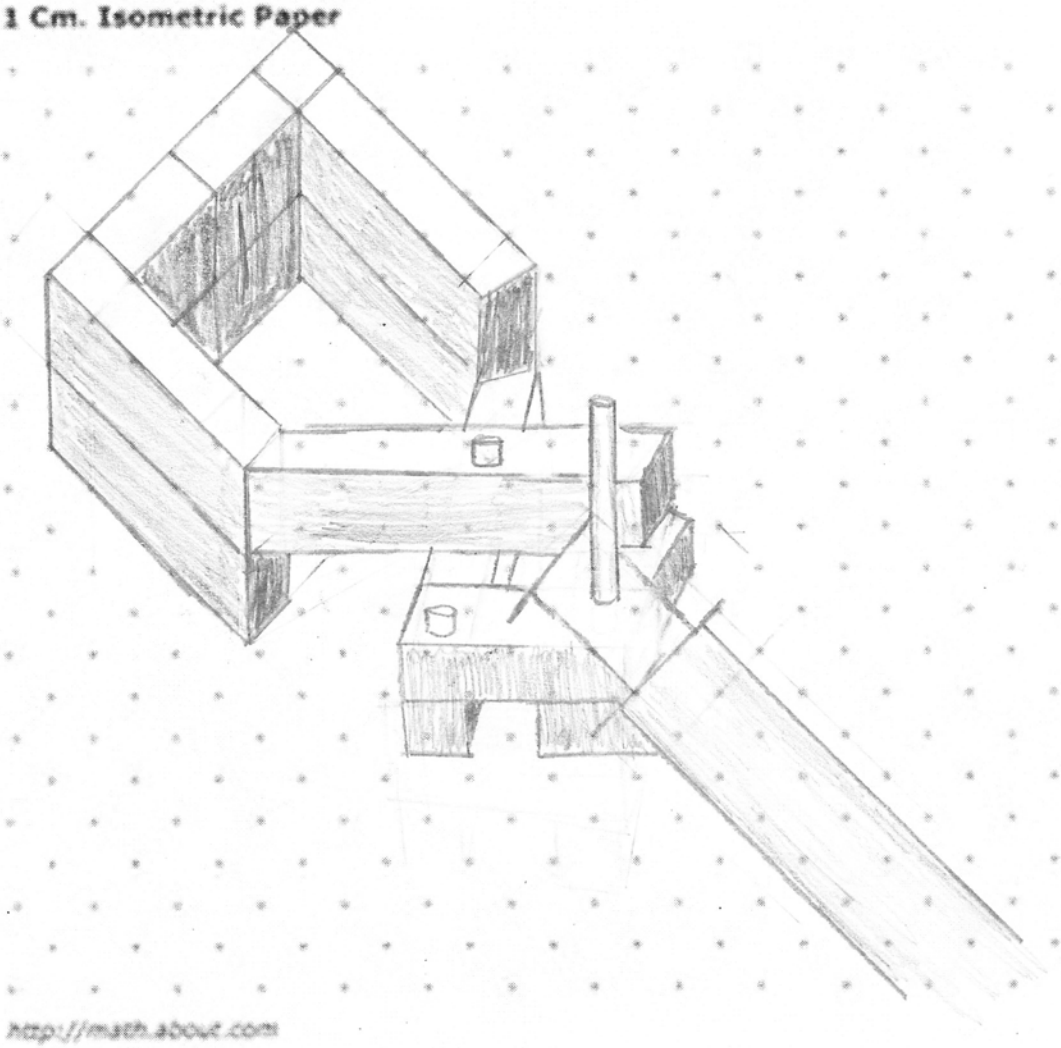
At first our design was a little bit complicated and rough, but as we went on the picture of the prototype became more and more vivid in our heads. The machine isn't the simplest thing in the world but it was designed to increase speed and efficiency. Also the base structure withstood any test we threw at it. Whether it be a drop test or just to see if it could hold up the arm. Another thing that became better and better throughout the three weeks of designing this was that everyone in the group became much more comfortable with each other kind of like a family.

Finally with these keys to success we truly believe that our structure will withstand the competition and the stress of the hydraulics so that it performs with maximum effectiveness.

1. Co-operation of team members in production of portfolio and planned production of their device.

Score 5/5 - enhanced by Judges' interview

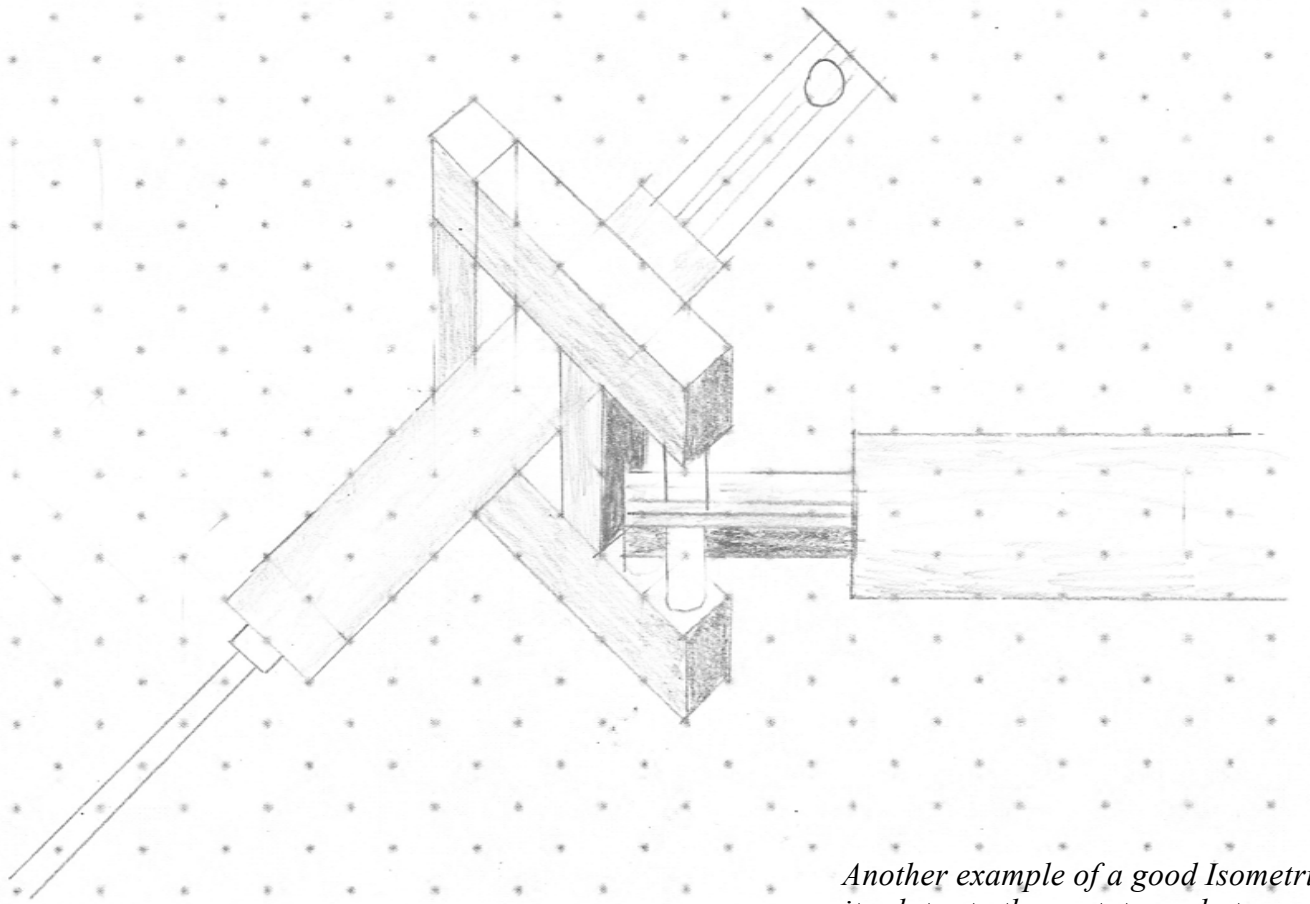
Gripper



2ii - Isometric drawing of a portion of the device
Score 2/2 (3/5 for sketches) - A good example of an Isometric drawing

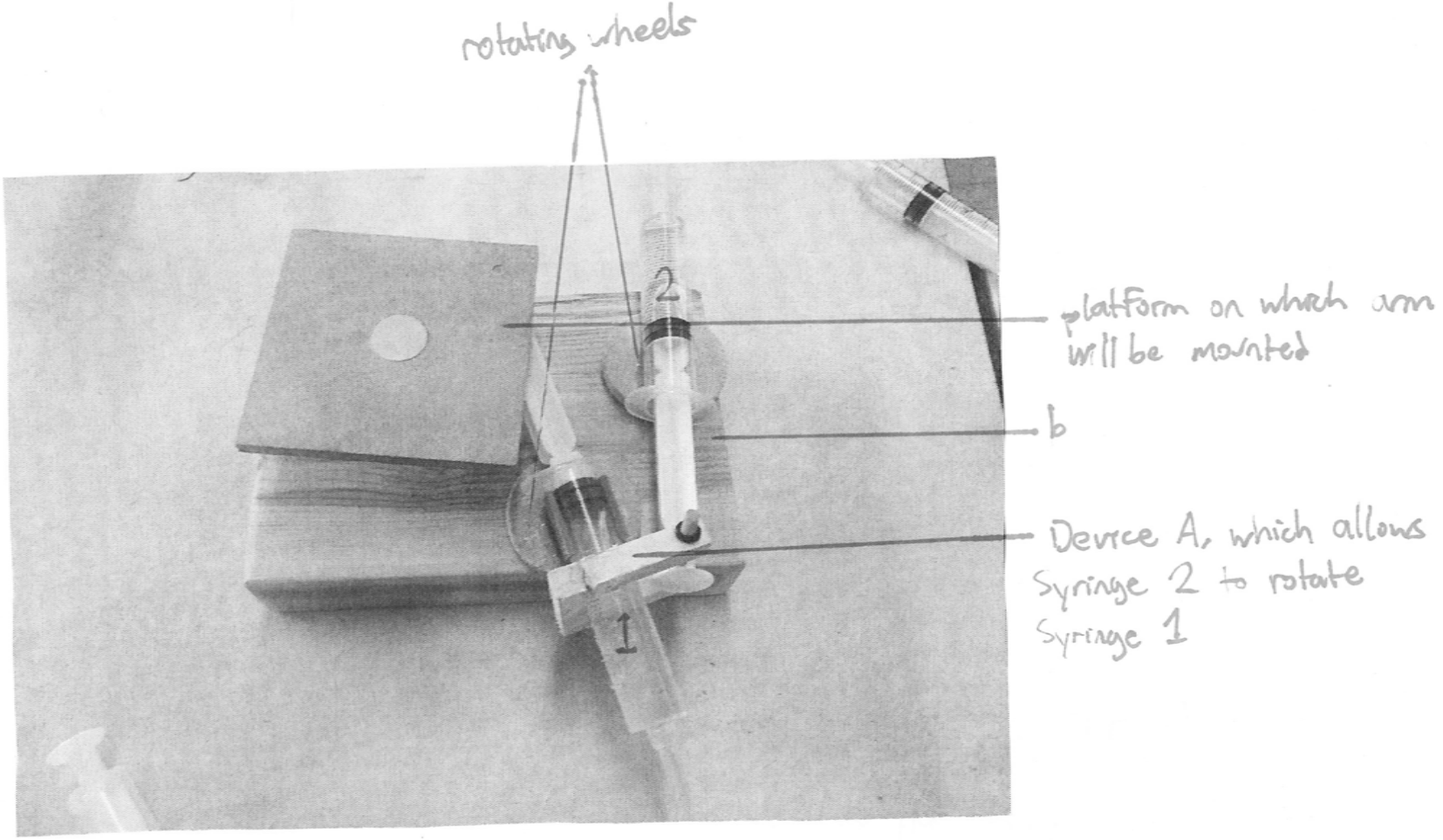
Base Syringe Rotation

1 Cm. Isometric Paper



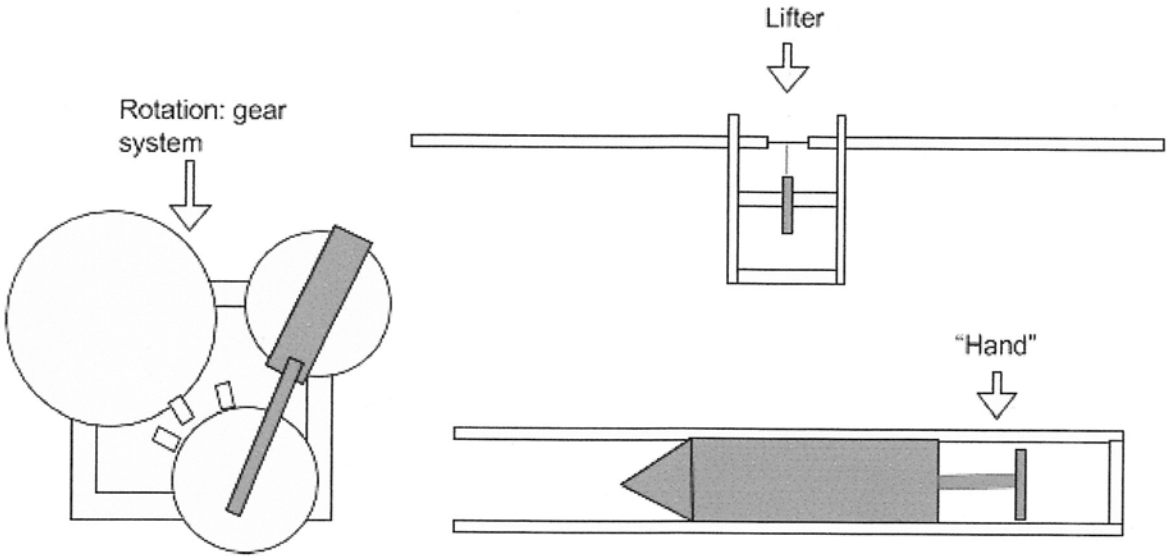
http://math.about.com

Another example of a good Isometric drawing - it relates to the prototype photograph on the following page.

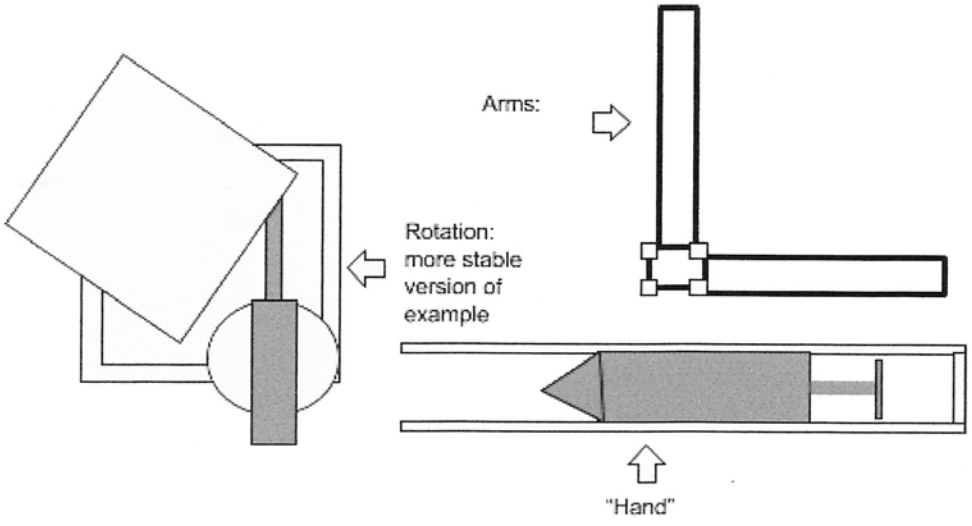

rotating wheels
2
platform on which arm will be mounted
b
Device A, which allows Syringe 2 to rotate Syringe 1
1

Sketches of three possible ideas

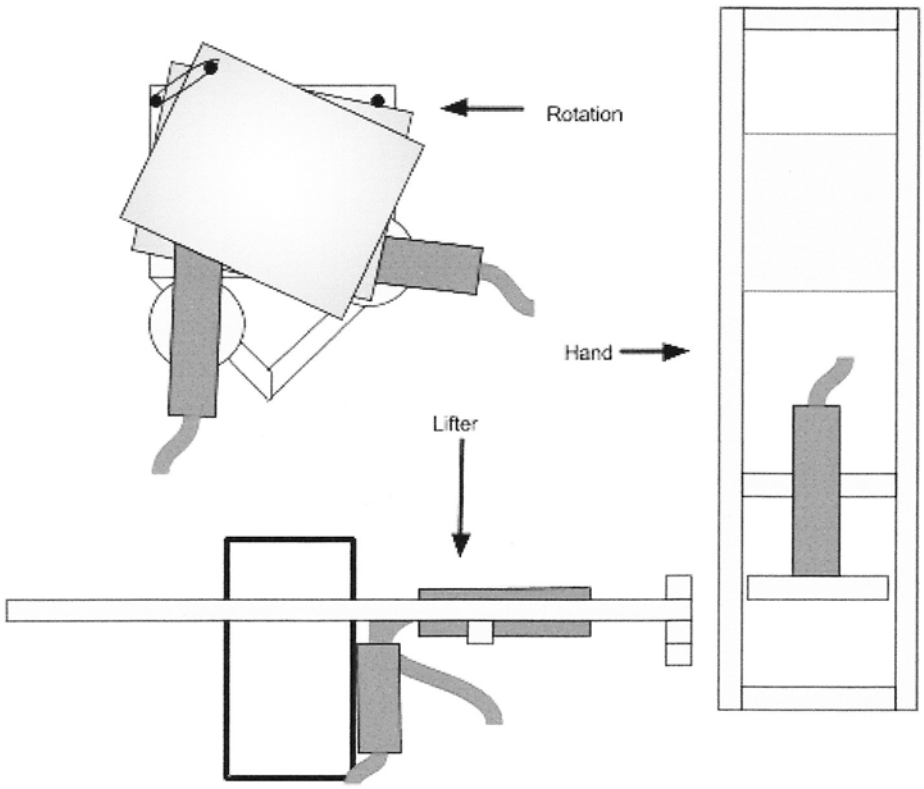
Solution 1:



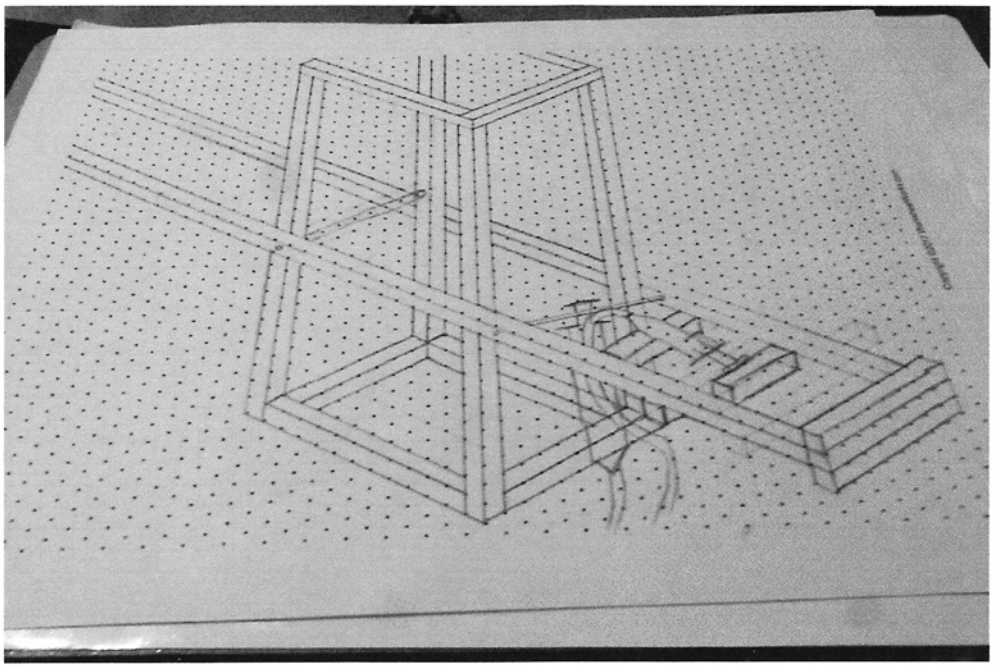
Solution 2:



Solution 3:



Isometric drawing



3: Orthographic drawings - (mislabelled "sketches")
Score 3/5 - the digital drawings are good and colored coded but lacked a key to identify components

CONSTRUCTION MATERIALS (includes list of **alternative materials**):

- **Wooden pieces (1 cm cross-section): 8 x 9 cm; 8 x 9 cm (2 pieces with 45 degree ends); 6 x 8 cm; 4 x 20.25 cm; 2 x 8.25 cm; 2 x 3.8 cm; 3 x 2.5 cm**
- **Green gusset corners: 3 cards**
- **6, 20 cc syringes**
- **Plastic tubing: 44 cm (Sabeeka's syringe); 141 cm (Hassan's syringe);**
- **37 cm (for rotating portion)**
- **Wooden dowels: 3/16" diameter: 2 x 12.75 cm; 1 x 7.75 cm; 1 x 4.5 cm; 1 x 2.25 cm**
- **Wooden dowel: 7/8" diameter: 1 x 7.5 cm**
- **Large wheel, with 7/8" diameter for hole x 1, medium wheel x 1**
- **Square platform with 7/8" and 3/16" holes**
- **Axle holders: 16**
- **Syringe holders: 4**
- **Mini-washers: 4**
- **Sticks to spread glue**
- **Bottle of wood glue**
- **Hot glue gun tubes**
- **Sheet of fine-grain sandpaper**

ARM PORTION OF STRUCTURE:

- **2 X 61 cm long wooden pieces (1 cm cross section)**
- **Two dowels, 17.5 cm in length**
- **Two support beams, first one 41.3 cm from top of vertical arms, second support**
  At 46. 3 cm from top of vertical arm (syringe is glued on top of these horizontal supports)
- **7.5 cm horizontal piece of wood glued at end of arms**
- **one horizontal wedge, 4.5 cm in length, at base of arms**

4. Materials list including consideration of alternatives: Score 4/5 - comprhensive list with 3 more alternatives on a second page

Description of Structural Strength and Stability

To keep the structure stable, we kept the center of gravity as low as possible, by putting most mass at the bottom. We made the rotating platform wide, to accommodate and stabilize the long arm, and also lowering the centre of gravity. We used counterweights to balance out the weight of the load (block) and the long arm from tipping, gluing pieces of wood on until the arm balanced.. Triangular gussets were used to improve the strength where wood was connected, because the triangle is the strongest shape. We used support beams on the arm to improve its strength against compression and tension and to keep the arm symmetrical. We plan on adding lines of hot glue as grip so that the gripper can grab the object with more strength. For the rotating platforms at the base, we will make the axles longer so that they don't wiggle around in the holes (this lowers the center of gravity of the axle - more to go in the hole).

5: Structural strength and stability
Score 5/5 - contains 5 terms used in correct context

Explanation of the Placement of Fluid Systems

We chose to use hydraulic systems. This is because water is more dense than air, so you cannot compress its molecules closer together. This means that our output actions will be stronger since the water will not lose volume when we input force (meaning that the syringe will move out to the same places each time). If we needed strong, sudden force, we would have used air, because you can compress air and release it for a short burst of pressure.

Gripper
When force is input to syringe A, it exerts pressure on the water which travels through the tube and syringe and exerts pressure on the pusher of syringe B. The end of syringe B then pushes on a compound linked lever, opening the claw.

Body
The syringe will be pushing on a first-class lever (the arm). We tried to put the syringe further away from the fulcrum of the arm for mechanical advantage. Although the syringe needs to move farther, it needs less force applied to it to get the same output. This will make it easier to move.

Base
To make the base rotate, we used a syringe to pull on one corner of the platform, but since we wanted to get 180° rotation, we used another syringe to rotate the first so it could continue pushing the corner of the platform.

6: Placement of Fluid Systems:

Score 4/5 - a good attempt

Prototype Evaluation

Our team constructed **three different prototypes** in order to achieve the goal of transporting the cuboid.

The first prototype was based on the idea of rotating the cuboid 180° in the y-axis. The prototype did not work and due to time constraints we moved onto the second solution, but some members are taking it up as a personal project.

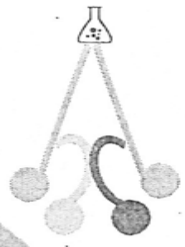
The second prototype was significantly more stable, but failed due to problems in getting the rotation mechanism to function properly. We repurposed the arm, lifting, and clamping mechanism in this design.

Our third prototype, which we are using in this competition. We continued to use the arm, lifting, and clamping mechanism in this design. We improved the structural stability of the machine by a large margin by lowering the centre of gravity, extending the base, and the formation of trusses. Our prototype experiences moderate amounts of friction while rotating. As well, we adjusted the measurements of existing parts to improve clamping and movement.

7: Evaluation of Prototype:

Score 5/5

As an added bonus!
4 pages of evaluation and reflection



Evaluation of Prototype

At the beginning of this journey, we had chosen two ideas. Our first idea had 2 arms which would share the base. We would've used the same idea to use a syringe and a wall to stabilize the load and a tower, and an exact replica on the other side. We would pick it up, turn it as much as it can, then there would be another arm waiting, then we would drop the load into the other arm and drop it off at the 8-point mark, but we found many flaws in this plan. There could've not been enough materials, not enough time, and a chance of dropping the block and not catching it with the other claw. Considering this we abandoned the project and reinvented a new design that would drop the blocks at the 5 point mark and allow us to move them very quickly. We have learnt that there is going to be trial and error and there is a lot of planning that goes towards this, but all of it was crucial to building the best prototype that we could. We also learnt that time management skills are also crucial, because

Reflection

Our Misplacements

When our prototype was completed the results were mostly as expected but everyone does all agree that during key portions of the design and construction phases we could have used better and more efficient tactics to improve the structure's integrity and performance.

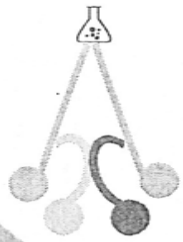
The prototype had faced troubles during its time in the production line and during early testing. There were project setbacks, delays, miscalculations, and many design errors.

But even as those mistakes were corrected the prototype cannot be identified as the absolute best of the best.

Our method of organizing notes, blueprints and design sketches could be improved with a pre established note storing method there should have been more attention put on keeping the notes instead of sometimes using them to place glue and later throw away. Management is one of the key things we can improve on next time.

As one of the great tactics of quickly finishing a project, sometimes that tactic can go really cause long term harm to the project. When we had setbacks the time had to be made up, we rushed during some key parts of the construction phase and that had caused minor imperfections causing the structure to lose some of it's efficiency and strength. With the next challenge we face, it is vital that an efficient network for distributing jobs is established and everyone is working full pace full time to ensure no further cutbacks and delays.

With many sections of the operation to pick at, these are definitely very critical new measures that must be taken to ensure the success of our structure.



Conclusion

We concluded our prototype at a high note but our official masterpiece would have to top that. Looking at what we needed to fix and reapplying that to the finishing product ensures that the same mistakes we have made before are not repeated again.
Like said before, we know understand that in the next round, we will focus strongly on working quickly while maintaining good quality pieces and accurate cuts. We also recognize that we will further work towards an efficient job distribution and allow for work to be done in orderly fashion and not disrupt the construction line or hold up any further development. As the majority of our structure requires quite different lengths of sections, there will be many times where splitting the time on many events and strategically working on specific portions of the structure is necessary. We take all of that into full consideration and will adjust our plan according to the situation. We work towards a final piece that will live up to it's expectations and delivers it's highly effective and smooth process. So making sure that everything top to bottom is absolutely perfect is critical to the success of the operation.

Our epilogue

As our journey has ended, we had learned plenty since the start. Working with our teammates, ensuring productivity, communicating ideas and allowing for frank and efficient discussions.

Together, we pushed forward a plan that works to solve the problem with excellent results and allowed for massive breakthroughs leading to greater achievements.

Figuring out what each member did best and how our design could be better improved by testing and plotting out scenarios. Getting inspired by things we see, hear and listen to. Embracing failures and seeing what we had done wrong allowed all our efforts to be used for further development.

There is no words to describe the adventure we've had, frustrating at times and other times delighted, happy that we are able to be chosen for this very elitist event that brings out the magic in all people.

In all, we are deeply humbled and honored to be given the chance to take part in this revolutionary journey that has allowed ourselves to become more confident, and more engaged. With a new seed planted in our still developing minds, who knows what effect this could have on our futures. The light of hope still shines bright as we embark on a new path towards the next era of our young lives. Thank you to the Power Fluid Challenge