PROJECT TWO: MILESTONE 2 – COVER PAGE

Team Number: Tues 28

Please list full names and MacID's of all *present* Team Members

Full Name:	MacID:
Luke West	westl5
Luigi Quattrociocchi	quattrl
Hetash Rattu	rattuh
Julian Cecchini	cecchinj

MILESTONE 2 (STAGE 1) – REFINED CONCEPT SKETCHES (MODELLING SUB-TEAM)

Team Number: Tues-28

You should have already completed this task individually prior to Design Studio 8.

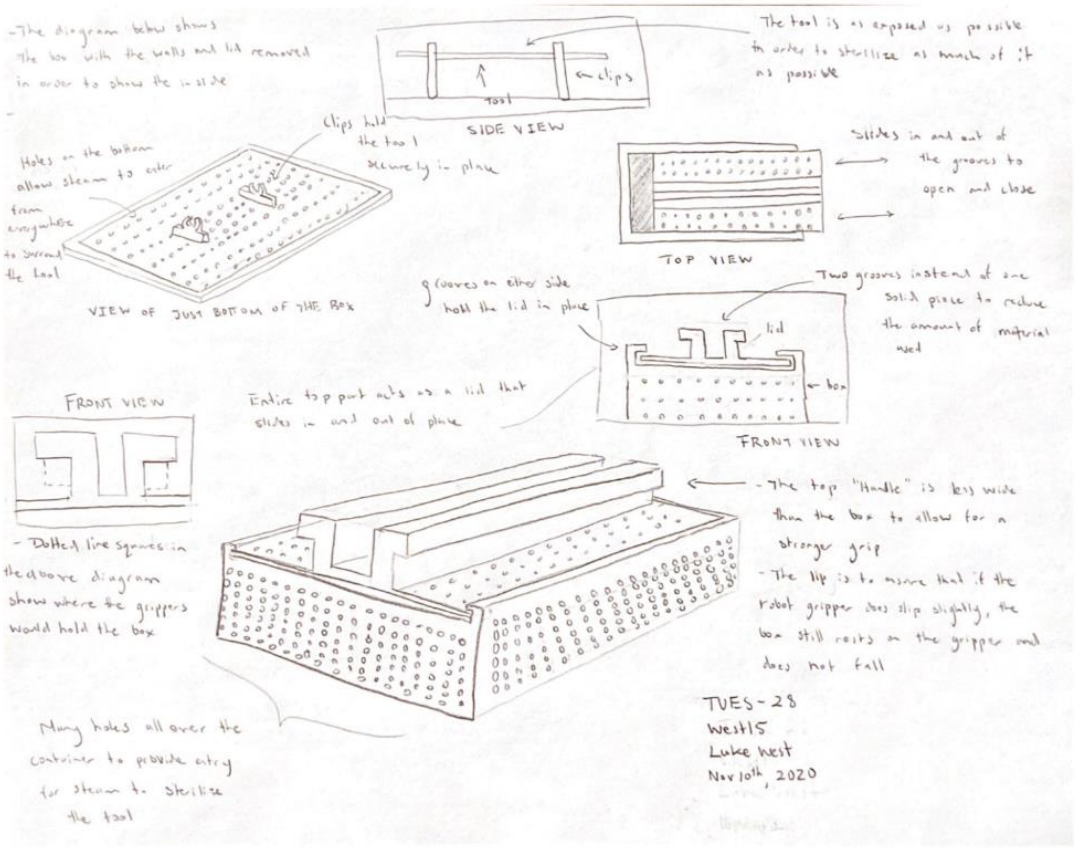
1. Copy-and-paste each sub-team member's refined sketch on the following pages (1 sketch per page)
   → Be sure to indicate each team member's Name and MacID

We are asking that you submit your work on both worksheets. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their refined concept sketches with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing ***Stage 3*** of the milestone

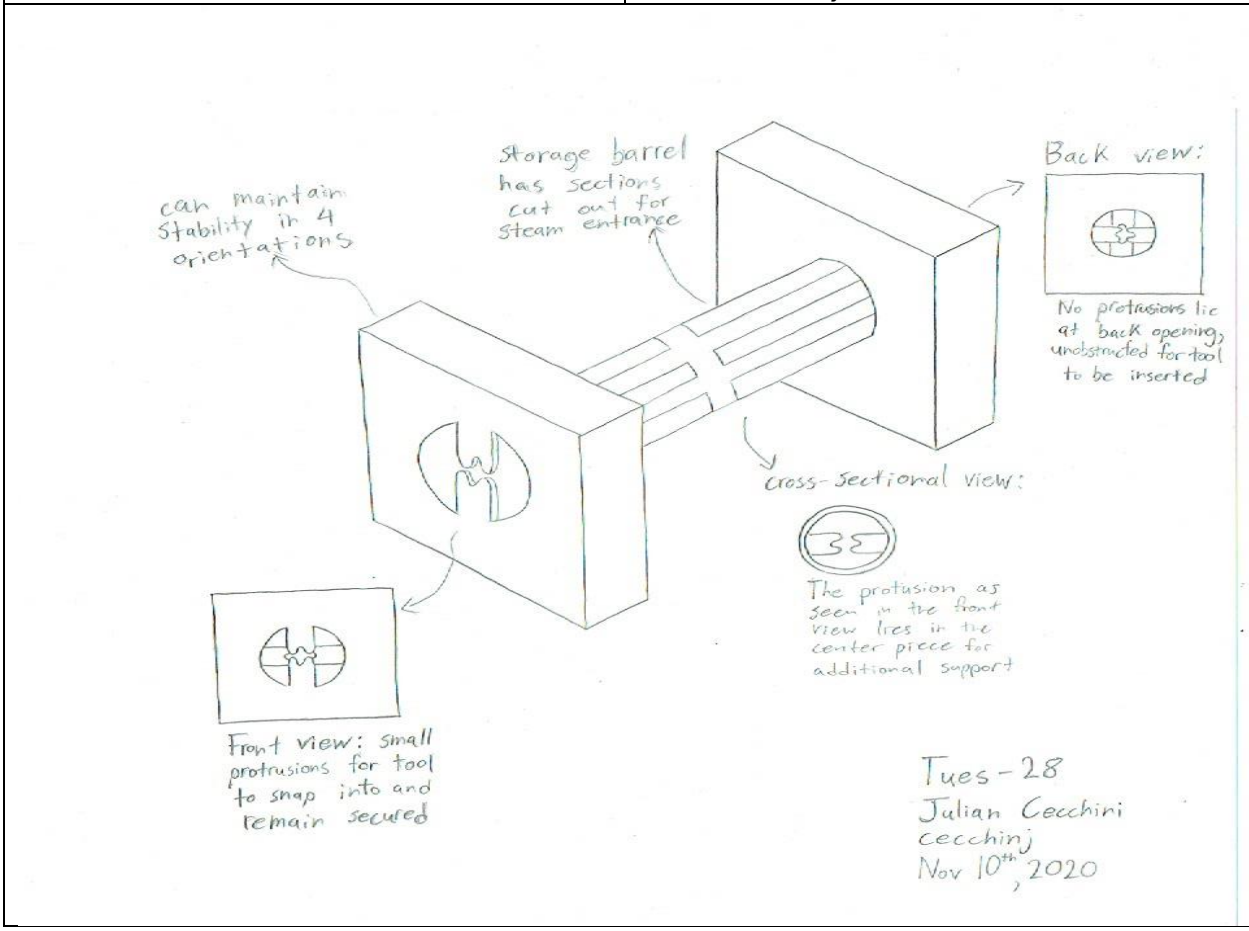
Team Number: Tues-28

Name: Luke West	MacID: westl5



Team Number: Tues-28

Name: Julian Cecchini	MacID: cecchinj



MILESTONE 2 (STAGE 2) – COMPUTER PROGRAM WORKFLOW (COMPUTATION SUB-TEAM)

Team Number: Tues-28

You should have already completed this task individually prior to Design Studio 8.

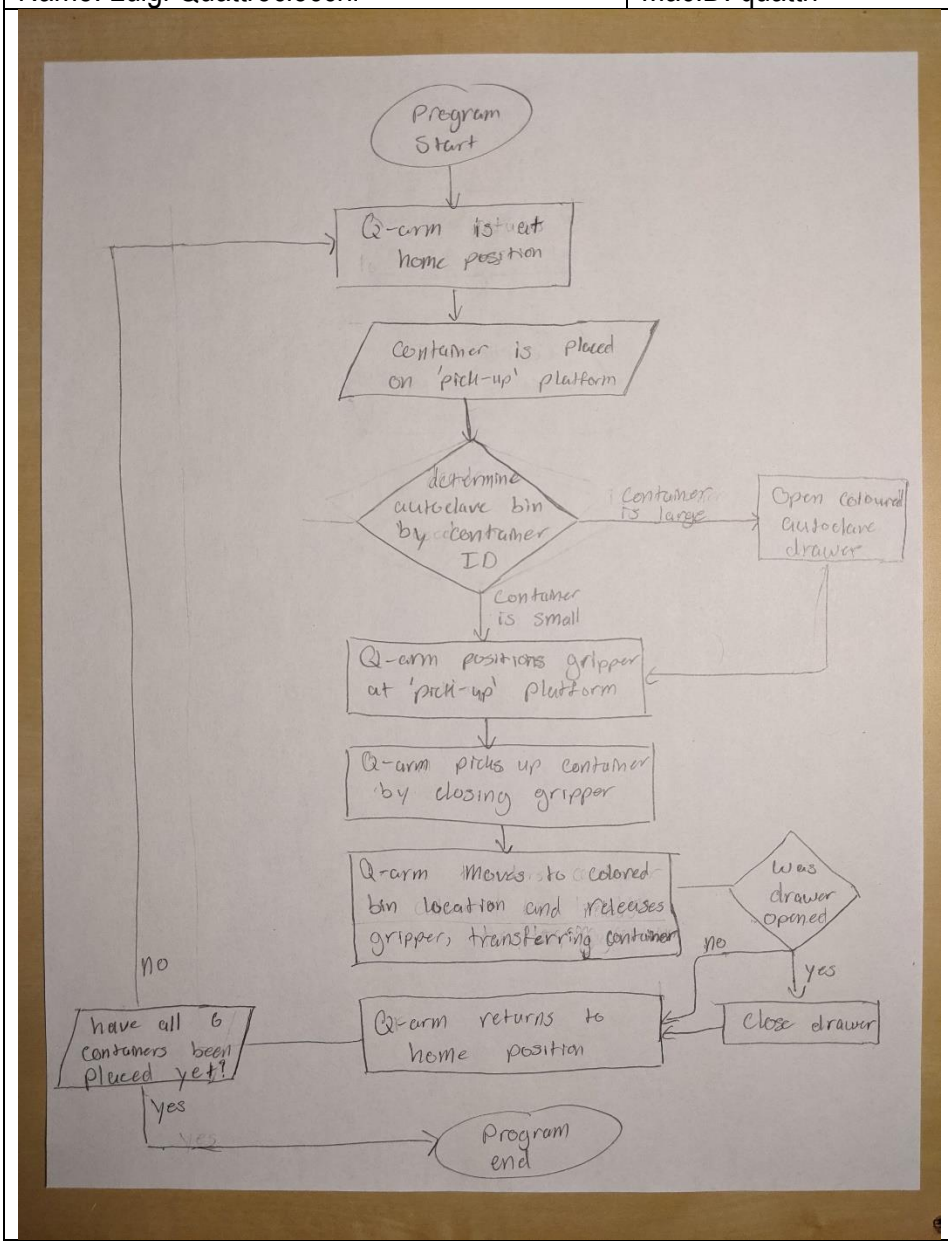
1. Copy-and-paste each team member's storyboard or flowchart sketches on the following pages (1 team member per page)
   → Be sure to indicate each team member's Name and MacID

We are asking that you submit your work on both worksheets. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their storyboard/flowchart with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing ***Stage 4*** of the milestone

Team Number: Tues-28

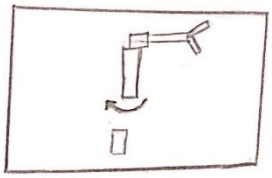
Name: Luigi Quattrociocchi	MacID: quattrl



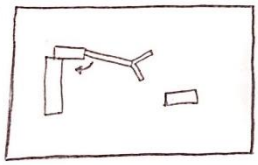
Team Number: Tues-28

Name: Hetash Rattu	MacID: rattuh

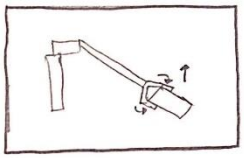
Q-arm Storyboard



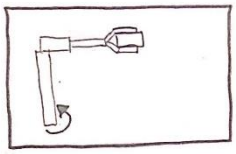
Rotate the base so it matchs the coordinates of the container



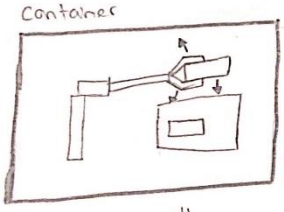
Rotate the arm downwards once the sensors detect the container



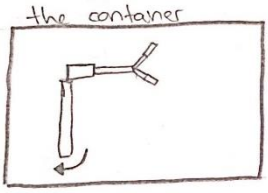
The container will be picked up by the gripper



The Q-arm will rotate to the bin that corresponds to the container.



The gripper will open and the container will go into the bin



The Q-arm will return to its original position and repeat the process with other containers

Team 28
Hetash Rattu
rattuh

MILESTONE 2 (STAGE 3A) – LOW-FIDELITY PROTOTYPE (MODELLING SUB-TEAM)

Team Number: Tues-28

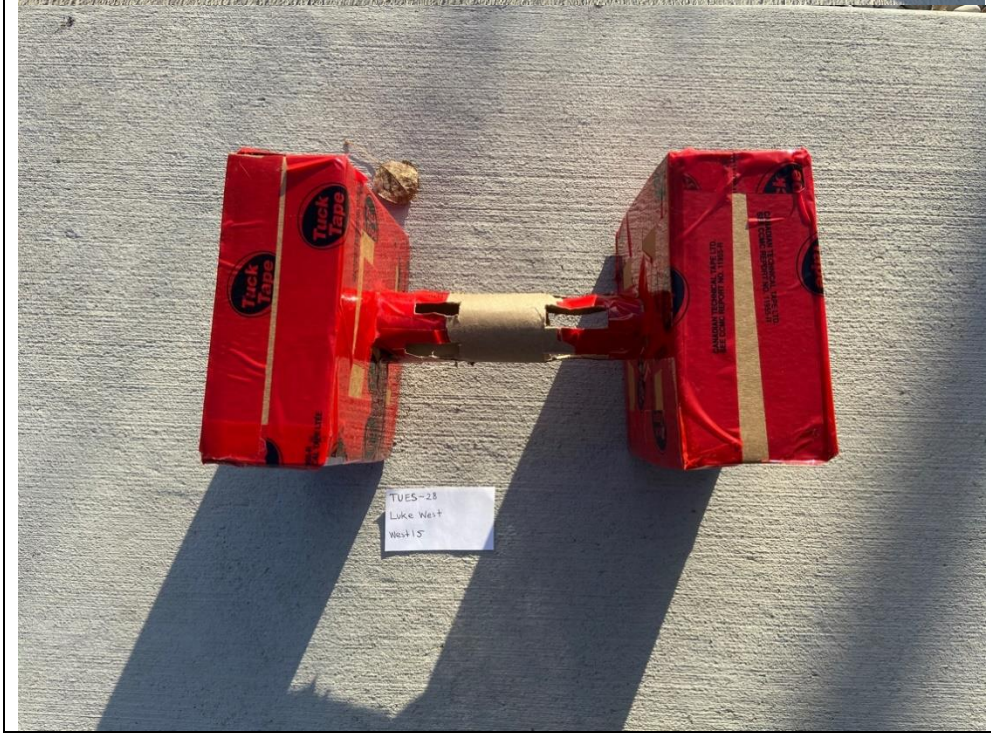
Complete this worksheet during design studio 8 after creating the low-fidelity prototypes.

1. Take multiple photos of your low-fidelity prototypes
   → Include an index card (or similar) next to the prototype, clearly indicating your Team Number, Name and MacID on *each* sketch
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *two* prototype photo's per page**

Make sure to include photos of each team member's prototype

Team Number: Tues-28

Name: Luke West	MacID: westl5

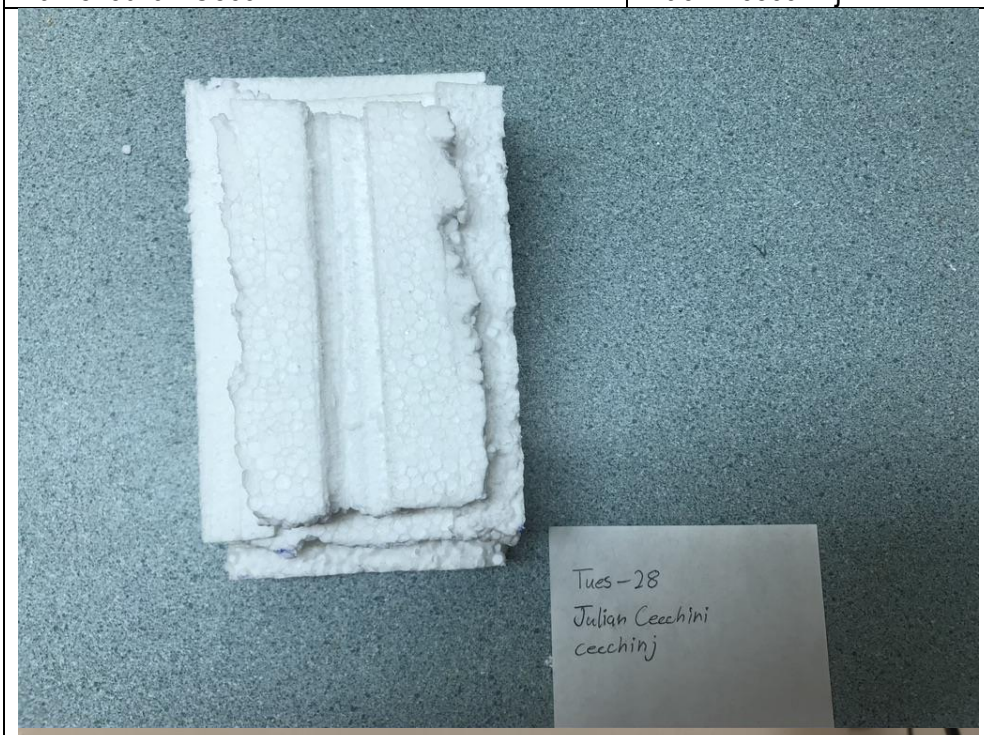


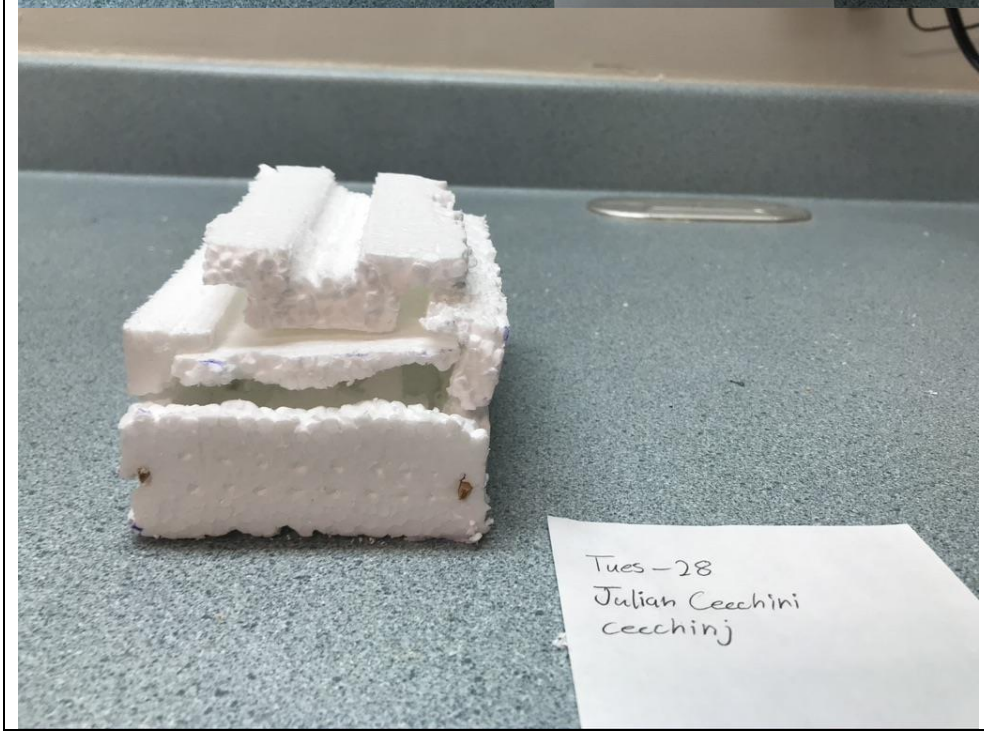

TUES-28
Luke West
West15

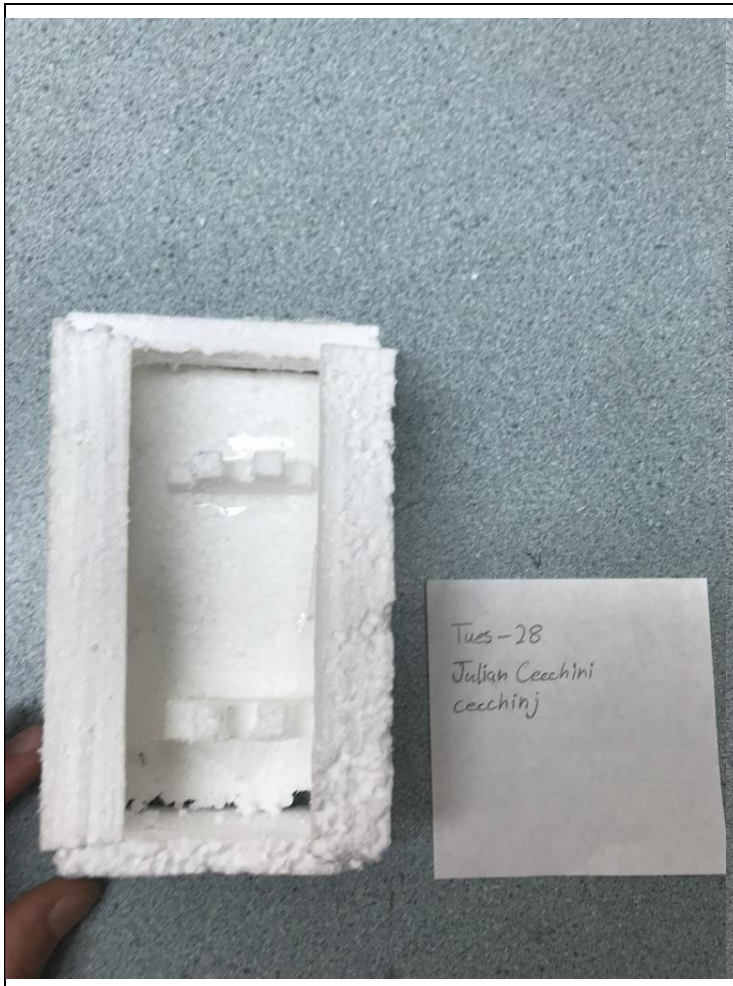

TECHNICAL TAPE LTD.
REPORT NO. 1195-R
Tuck Tape
TUES-28
Luke West
West15

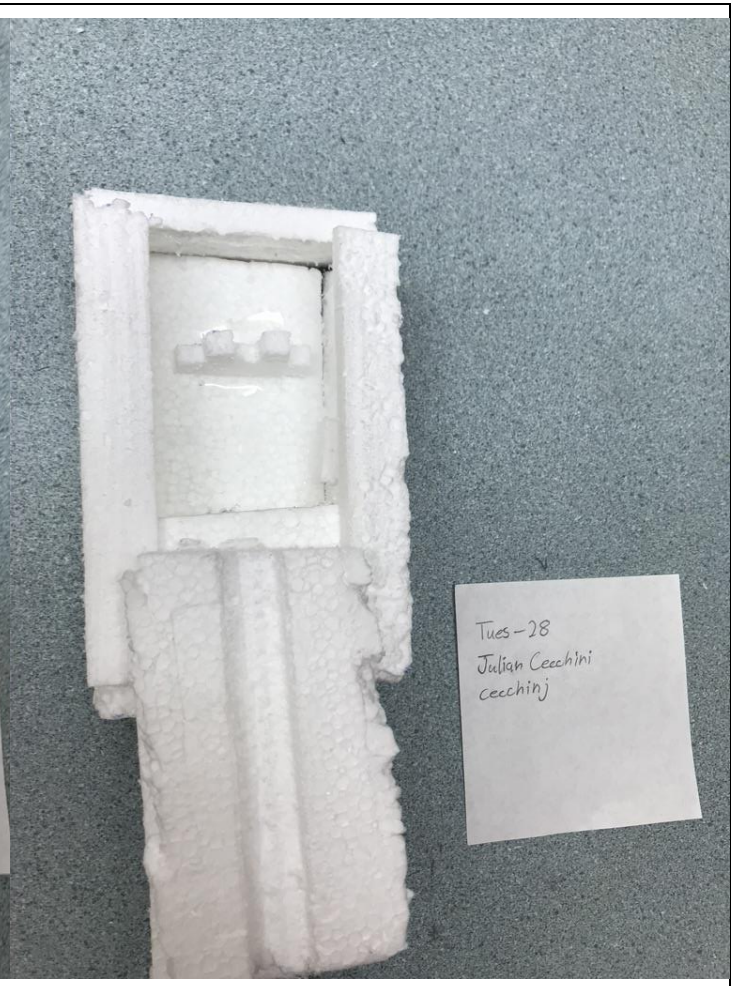
Team Number: Tues-28

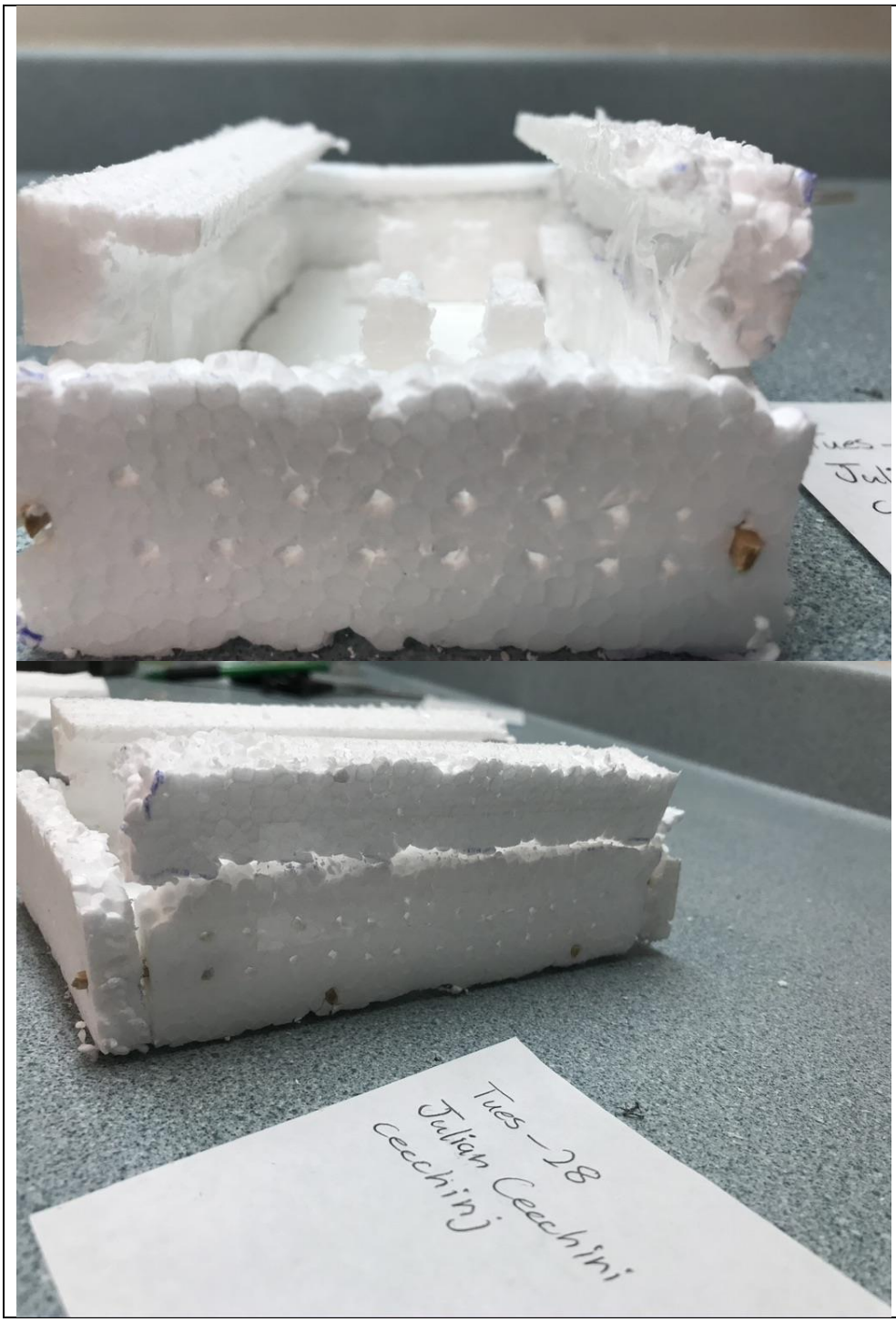
Name: Julian Cecchini	MacID: cecchinj

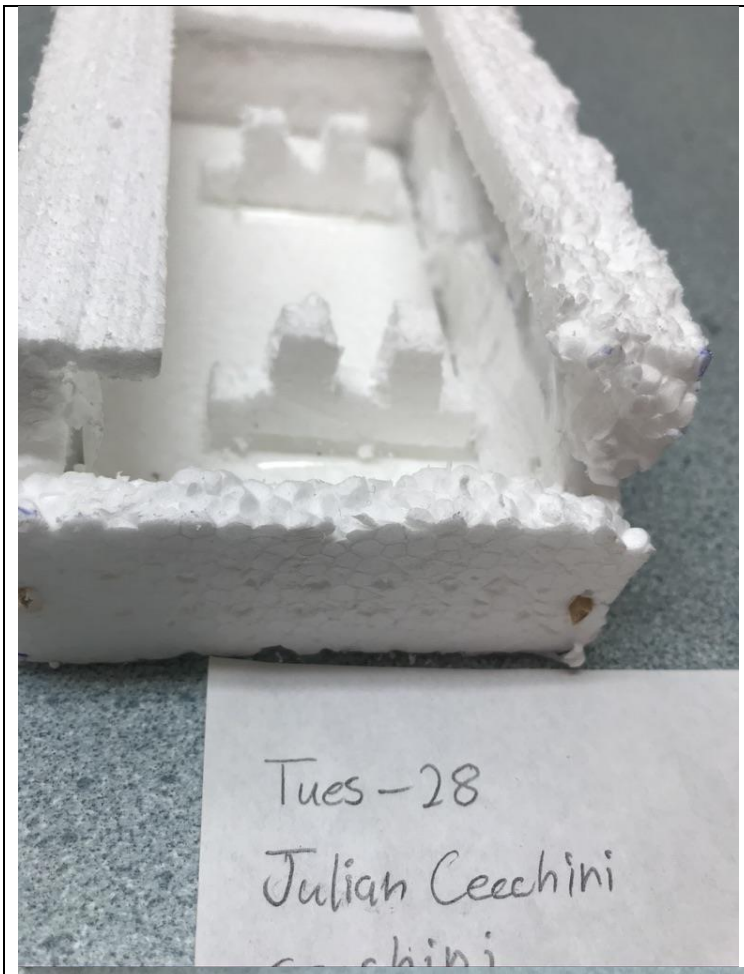


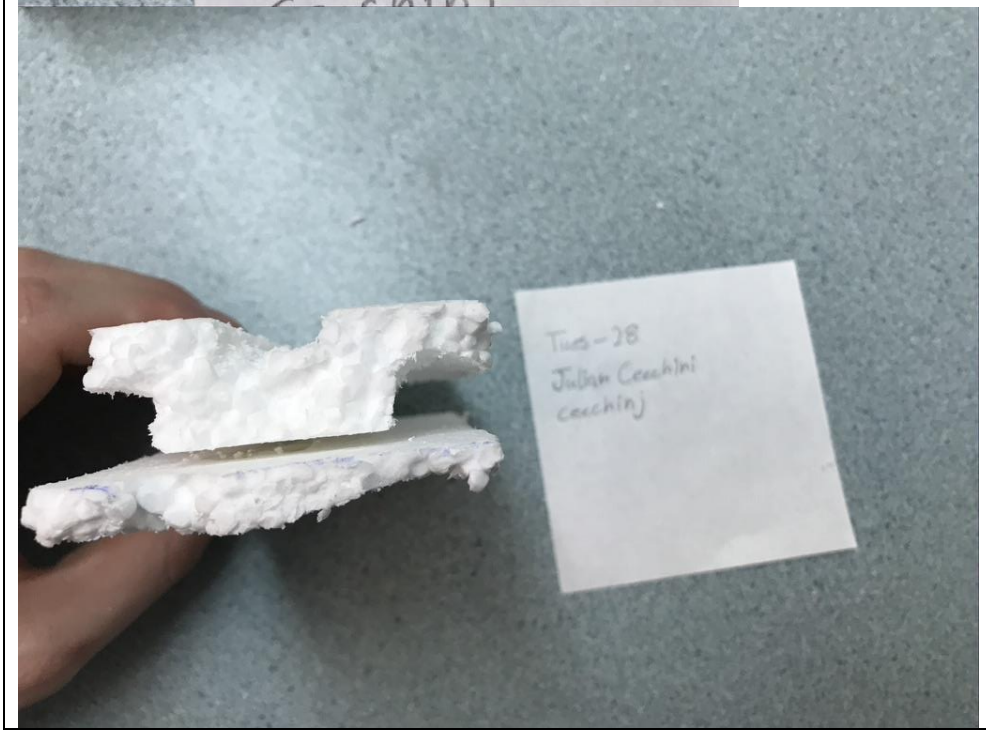



Tues-28
Julian Cecchini
cecchinj


Tues-28
Julian Cecchini
cecchinj


Tues – 28
Julian Cecchini
Cecchinj


Tues-28
Julian Ceechini


Tues-28
Julian Ceechini
ceechinj

MILESTONE 2 (STAGE 3B) – LOW-FIDELITY PROTOTYPE OBSERVATIONS (MODELLING SUB-TEAM)

Team Number: Tues-28

As a team, document your observations for each low-fidelity prototype. Make sure to label your observations to indicate which prototype it belongs to. As a starting, consider the following: (note, this does not fully encompass all discussion points)

→ Advantages and disadvantages of each prototype
→ Extent to which each concept aligns (or does not align) with the List of Objectives, Constraints, and Functions you came up with for Milestone 1
→ Reliability of the design in picking up the surgical tool
→ Reliability of the design in securing the surgical tool
→ Extent to which it allows for tool sterilization

Prototype – Julian Cecchini/cecchinj's design prototyped by Luke West/westl5 (displayed first)

- *Advantage: can be picked up or dropped off in different orientations (once tool is inside cylinder, it can take on each orientation the rectangular-prism blocks provide)*
- *Advantage: Overall design has design low complexity (I.e., no sliding parts & small number of components)*
- *Disadvantage: original design has a lot of thinned out parts that may need to be reconsidered for the minimum thickness of 5 mm in the 3D printing process.*
- *Disadvantage: The area where the robot grips the container is circular, while gripper is square, therefore, the robot may have trouble gripping the container. Thus depending on the size of the tool that it must contain, it may be less reliable for pick up via the robot arm.*
- *Is reliable for securing the surgical tool via internal protrusions.*
- *Of our objectives, it fulfills being rigid and should be lightweight as there's no excessively large component. Constraint-wise: it possibly fails complexity goal, but further analysis is needed to determine this. Lastly, it fulfills the functions of securing the tool, being sterilizable by steam, and being picked up by the robotic arm. The rest are indeterminable as the dimensions and material are still unknown.*
- *Unique in concept, untypical to find containers which stray so far from a rectangular prism.*
- *Since cardboard toilet paper was used for cylinder, holes in central tube resulted in loss of structural integrity – therefore, a stiff material must be used.*

- *As mentioned, allows for a high level of sterilization through cut out spots along central cylinder (steam can enter and exit with relative ease).*

Prototype – Luke West/westl5 ‘s design prototyped by Julian Cecchini/cecchinj (displayed second)

- *Advantage: spacious, allows for any range of tools (versatile).*
- *Disadvantage: hole size/number may need to be modified in order to accommodate for 3D printing.*
- *Advantage: Easily gripped by robot, stable/secure holding of tool.*
- *Disadvantage/modification: The grooves that the robot grips are a potentially excessive use of filament. May need to shorten as needed.*
- *Since there are holes everywhere, very reliable for sterilization.*
- *Can be easily modified (sized up or down) to accommodate different sizes*
- *Objectives: Fulfills rigidity, fulfills the constraints and functions in the same way as mentioned for the first model.*
- *Sliding mechanism is both aesthetic and useful. Adds some flair to the design.*
- *Unlike first prototype, resizing won’t affect the robot’s ability to grip it*

(From previous milestone, table of objectives constraints, and functions)

Objectives	Constraints	Functions
Should be resistant to high temperatures	All features must be greater than 4mm	Tools should be able to be placed and extracted from the container
Should have a distinct colour	Scaled down weight does not exceed 350 g	Be able to securely house tools
Should be chemically inert	Complexity of parts if minimum; print time of replication cannot exceed 2 hours	Be able to able to be picked up by the robot arm
Should be lightweight	Max 170 mm min 80 mm	Must allow sterilization of tools by steam
Should be rigid and hold its shape	Base must fit within the autoclave	Base must be able to remain inside its respective autoclave
	Caters towards effector grip	

MILESTONE 2 (STAGE 4A) – WORKFLOW PEER-REVIEW (COMPUTATION SUB-TEAM)

Team Number: Tues-28

As a team, document your observations, specifically any similarities and differences between each team member's visual storyboard or flowchart in the table below.

Differences:

- One workflow was in the form of a flowchart while the other was a storyboard
  - Flowchart was chosen for more organized workflow
  - Storyboard was chosen for visual representation of workflow
  - Both methods are valid for this workflow
- Moving to home position was described differently: storyboard was more specific
  - Flowchart assumed the home process would be premade and consistent
  - Storyboard manually rotated to the zero position
  - Flowchart is recommended as there is an existing arm.home() method
- Flowchart had decision processes while storyboard was vaguer about deciding which autoclave bin each container would go to
  - Flowchart decides which location to move to based on ID (colour and size)
  - Storyboard didn't take into account that there would be differences in ID
- Flowchart had decision process to open and close drawer while storyboard did not
  - Flowchart realized drawer only needs to be opened if container is large
- Storyboard detailed movements and rotations of arm, while flowchart did not
  - Storyboard was specific about each movement of the Q-arm

Similarities:

- Both workflows described the moving of container to the proper autoclave bin
- Both described action of picking up and container by gripping the container
- Both described moving container to its correct autoclave bin
- Both had a looping structure that would iterate for every container

MILESTONE 2 (STAGE 4B) – PROGRAM PSEUDOCODE (COMPUTATION SUB-TEAM)

Team Number: Tues-28

As a team, write out a pseudocode outlining the high-level workflow of your computer program in the space below.

Start

Arm moves to home position

Place container on pick-up platform

Determine which color the container is based on ID

Position arm at pick up platform

Close gripper

Position arm over corresponding colored autoclave bin location

If container ID is large size

    Open corresponding colored autoclave drawer

Open gripper

If container ID is large size

    Close corresponding colored autoclave drawer

Arm moves to home position

Repeat for all containers

Stop