MILESTONE 1 (STAGE 2) – LIST OF OBJECTIVES, CONSTRAINTS, AND FUNCTIONS

Team ID: Mon-16

1. As a team, create a final a list of objectives, constraints, and functions in the table below.
   → Use your individual *Pre-Project Assignment* to build your team's final list
   → The exact number you should have depends on what information you have gathered from the Project Module.

Objectives	**Constraints**	**Functions**
Container should be rigid and durable	*Container must fit within the assigned autoclave footprint*	Securely holds surgical tools
Resistant to high temperature	*Base must lay parallel to the assigned autoclave floor*	Facilitates sterilization
Unreactive with chemicals used to sterilize	*Must be able to be picked up by the robot arm's end effector – max width of 80-150 mm*	Secures tools during travel
Low thermal expansion	*All features must exceed 2 mm*	Be able to be picked up by robot arm
Identifiable by the robot arm	*Mass does not exceed 350g*	Store liquid
Impervious to liquids		

2. What is the primary function of the entire system?

Allows the sterilization of surgical tools.

3. What are the secondary functions?

Securely holds surgical tools
Able to be picked up by robot arm
Store liquid

MILESTONE 1 (STAGE 3) – MORPHOLOGICAL ANALYSIS

Team ID: Mon-16

1. Identify multiple means to perform the secondary functions that your team came up with during Stage 1 of this milestone. One sub-function (pick up) is already listed for you. The other two sub-functions are for your team to choose.
   → Make sure that every mean for the "pick up" sub-function assumes that the end effector of the robot arm is a gripper. The means for your other sub-functions do not need to follow this assumption.

Function	**Means**					
Pick up	Handle	Holes for gripper	Hook	Lip on the edge		
Tool Storage	Box	Basket	Tool cutout	Adhesive strips	Magnet	Pouch
Store liquid	Bowl	Container	Cup	Box		

MILESTONE TWO (TEAM): SUBTEAMS, SKETCHES, & WORKFLOW

PROJECT TWO: MILESTONE 2 – COVER PAGE

Team ID: Mon-16

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

Full Name:	MacID:
Mohammad Bilal	bilalm14
Owen Brazel	brazelo
ZiDi Yao	yaoz25
Ibrahim Arif Qadeer	qadeeri
Muhammad Saad Siddiqi (Online)	siddim98

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

Team ID: Mon-16

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

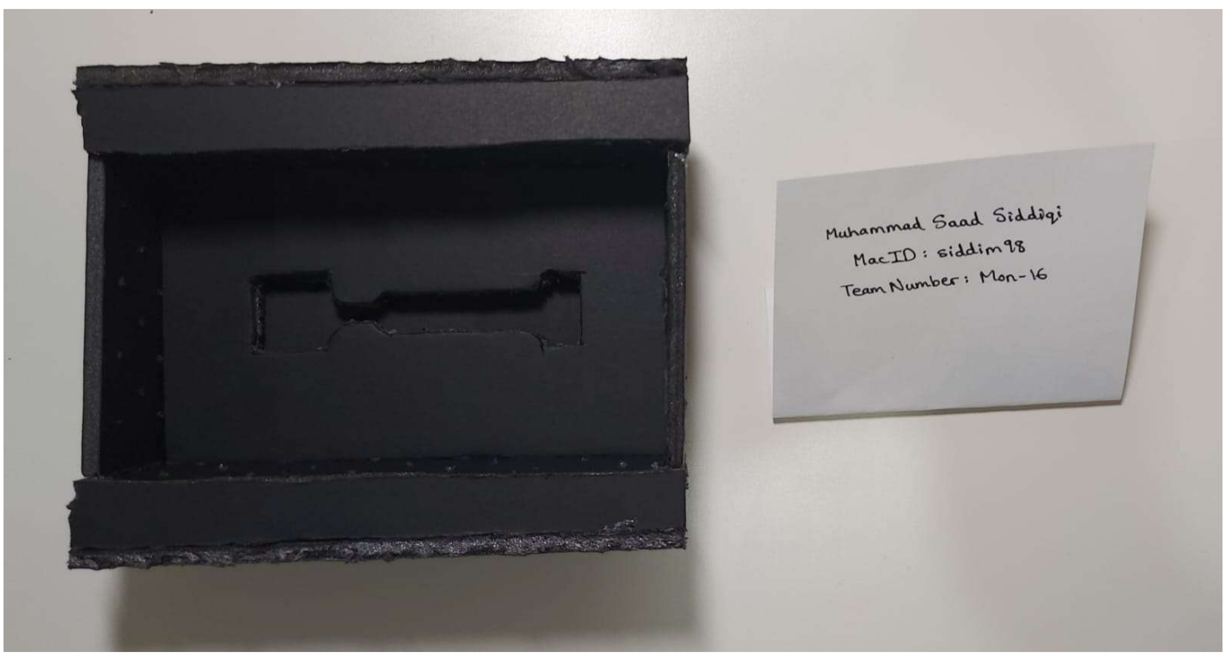
1. Take multiple photos of your low-fidelity prototypes
   → Include an index card (or similar) next to the prototype, clearly indicating your Team Number, Name and MacID on *each* sketch
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *two* prototype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

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

Team ID: Mon-16

Name: Muhammad Saad Siddiqi	MacID: siddim98

Insert screenshot(s) of your low-fidelity prototype below

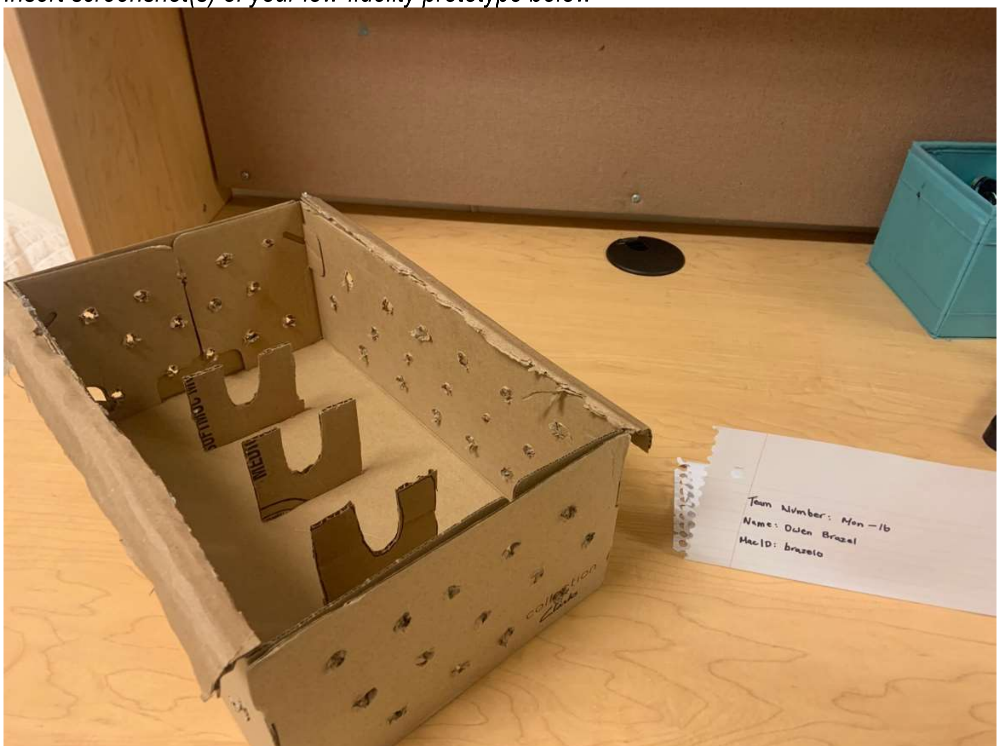


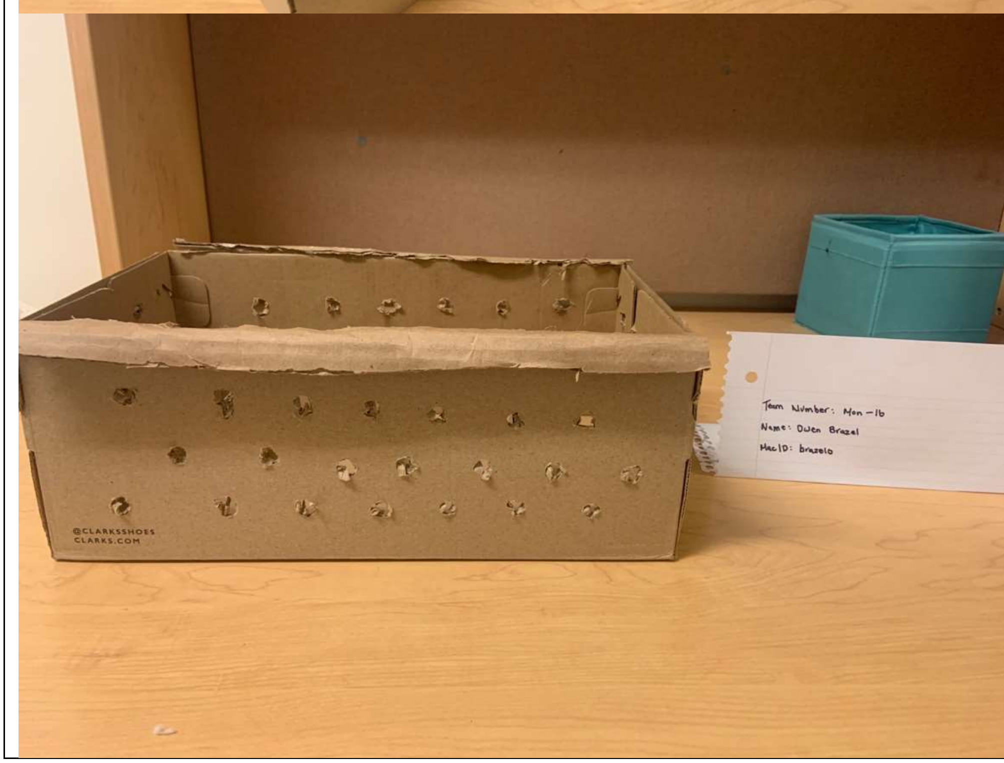
Insert screenshot(s) of your low-fidelity prototype below

Team ID: Mon-16

Name: Owen Brazel	MacID: brazelo

Insert screenshot(s) of your low-fidelity prototype below





*If you are in a sub-team of 3, please copy and paste the above on a new page

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

Team ID: Mon-16

As a sub-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

*Document your observations for each prototype in the space below. It is recommended you document observations in a **table** or in bullet form (it should be clear which prototype you are referring to for each observation.*

	Prototype 1 – Designed by Owen Brazel (Low-fidelity prototype and observervations made by Saad Siddiqi)	Prototype 2 – Designed by Saad Siddiqi (Low-fidelity prototype and observervations made by Owen Brazel)
Advantages	- Holes around the container allow for sterilization to occur smoothly - Cut out at the bottom securely holds the surgical tool - Lip on outer edge aids the robot arm to transfer the container easily	- Allows for easy sterilization - Securely holds the tool - Can hold tool easily - Has a lip on the outer edge of the box to allow the robot arm to pick it up easierBox is not more than 350g
Disadvantages	- No upper lid or strap to stop tool from falling out of the cut out if the container is flipped over	- No handle - No lid to stop the tool from falling if the tool falls from the holder
Objectives (Not Aligned)	- Impervious to liquids	- Impervious to liquids
Constraints (Aligned)	- Max width of 80-150 mm - All features exceed 2 mm - Mass does not exceed 350 g	- Edges are more than 2mm - Design allows for transportation - Box is not more than 350g - Max width of 80-150mm
Functions (Not Aligned)	- Store liquid	- Store liquid

Reliability	- Design is reliable in picking up surgical tool - Design is reliable in securing surgical tool - Design allows for tool sterilization	- Design is reliable in picking up surgical tool - Design is reliable in securing surgical tool - Design allows for tool sterilization

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

Team ID: Mon-16

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

Document your observations for each visual storyboard / flowchart in the space below. Similarities: - Both flowcharts start off at home position and move to pick up location - Both flowcharts involve a decision to be made to determine the size of the container - Both flowcharts perform the same function based on the size of container (open and close drawer if the container is large) - Both Flowcharts involve looping if all containers have not been moved Differences: - One flowchart uses potentiometers to adjust the grippers - One flowchart starts off with a decision whether there are any containers left - One flowchart does not check at the end whether there are any other containers left to move

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

Team ID: Mon-16

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

```
Program starts
While all containers have not been moved:
        Q-arm moves to home position
        Move Q-arm to pickup location using predetermined xyz coordinates
        Using the right potentiometer to control the angle of rotation.
        Using the left-potentiometer to control which position to place in the autoclave
        If container size matches the position of the autoclave(determine though container
id):
                Then move q-arm to drop off location using xyz coordinates
                Open autoclave drawer
                Move q-arm back to container location
                Pick up container and move to drop off location
                Close autoclave drawer
        Elif container is small (determine through container id):
                Then pickup container and move to drop off location
        If all containers have been moved:
                Break out of loop
Program ends
```