

PROJECT TWO: MILESTONE 1 – COVER PAGE

Team Number: Tues-23

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

Full Name:	MacID:
Josh Suh	suhj13
Adiyan Ahmed	ahmea45
Borna Sadeghi	sadegb1
Aldraech Liac	liaca

MILESTONE 1 (STAGE 1) – PRE-PROJECT ASSIGNMENT

Team Number:

Tues-23

You should have already completed this task individually prior to Design Studio 7.

1. Copy-and-paste each team member's list of objectives, constraints and functions on the following pages (1 team member per page)
 - a. 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 list of objectives, constraints and functions with the **Milestone One Individual Worksheets** document so that it can be *graded*
- Compiling your individual work into this **Milestone One Team Worksheets** document allows you to readily access your team member's work
 - This will be especially helpful when completing **Stage 2** of the milestone

Team Number: Tues-23

Name: Adiyah Ahmed

MacID: ahmea45

Copy-and-paste the pre-project assignment for one team member in the space below

Objectives

- Container should be secure (to hold tool)
- Container should be penetrable (to allow sterilization)
- Program should be able to correctly match container and autoclave
- Program should be able to be controlled accurately
- Arm should be securely holding onto container

Constraints

- Size of base of each container must be less than size of corresponding autoclave
- Each container must be less than 80mm in width, to allow tight grip
- Every feature in the container must be greater than 4mm in size
- Container must be able to be picked up by two fingered robot arms

Functions

- System should securely transfer containers to autoclave for sterilization* (Primary function)
- Container should restrict movement of tool inside
- Container should allow access for steam (to facilitate sterilization)
- Container should fit in autoclave
- Program should identify size and colour
- Program should pick up and release container
- Program should open and close drawers
- Program should track which containers have been placed

Team Number:

Tues-23

Name: Josh Suh

MacID: suhj13

Copy-and-paste the pre-project assignment for one team member in the space below

Objectives

- Containers should be lightweight
- Robotic arm should easily grip onto the container
- Container can be eco friendly
- Containers can be reusable
- Robotic arm should be lightweight
- Robotic arm should be able to transfer equipment without much delay

Constraints

- Size of base of each container must be less than size of corresponding autoclave
- The width of the container should be at most 80mm
- The space in container should be wide enough to hold tools
- Container should allow enough gas to enter for tools to be sterilized
- The program should be able to distinguish which container corresponds to an autoclave

Functions

- Program must be able to recognize which container goes into which autoclave
- Program must be able to recognize which tool goes into corresponding container
- Container must be able to be picked up
- Container must be able to hold tools with no problem
- Autoclave should be able to seal itself to pressurize the gas which sterilizes the tool
- The tools should be sterilized at the end of the process

Name: Aldraech Liac	MacID: liaca
<p><i>Objectives</i></p> <ul style="list-style-type: none"> • Design can be light weight • Be small and compact • Be durable • Be relatively cheap to manufacture • Be easy to access • Be able to clean and maintain sterilization of tools within • Box can be reusable • Box can be versatile • Arm can be able to drop the tools in certain positions <p><i>Constraints</i></p> <ul style="list-style-type: none"> • Box Must keep instruments inside clean and sterile • Box Must open and close • Container must be large enough to house tools • The box must have a width of 80mm or less to have a strong grip • Container must have holes so that steam can enter and sterilize the tools within the box • Container must be able to fit inside of the autoclave • Despite abuse on the outside, the box must keep the tools inside safe • Arm must be able to carry the container and the tools • Arm must be able to move within a certain degree (to reach the tools and box) <p><i>Functions</i></p> <ul style="list-style-type: none"> • Is easily opened/closed when desired • Tools can be taken out of the box relatively easy • Box cannot be opened unless desired • Container is easily carried around • Arm can pick up the tools and the box • Program can distinguish the containers and keep track of the which containers are placed • Can place containers in their proper containers 	

Team Number:

Tues-23

Name: Borna Sadeghi	MacID: sadegb1
<i>Objectives</i> <ul style="list-style-type: none">• Should be able to grasp all given surgical tools• Container should securely transfer tools• Should be able to identify tool sizes• Should be able to put tools in the correct container• Container should be lightweight for easy storage• Container should be made of durable materials• Computer program should always work• Container should be easy to grab <i>Constraints</i> <ul style="list-style-type: none">• Items should not slip from the grip of the arm• Should be large enough to fit all given tools• Should be small enough to minimize space taken in autoclave• Container should not be sealed to allow the autoclave to sterilize the tools inside• Container must not be damaged by arm or autoclave <i>Functions</i> <ul style="list-style-type: none">• Carry tools• Identify tools by size• Place tools in their respective container	

*If you are in a team of 5, please copy and paste the above on a new page

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

Team Number: Tues-23

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 Pack.

Objectives	Constraints	Functions
Container should be able to keep the contained tool secure	Container holding the tool must be able to fit within the autoclave.	System can securely transfer containers to autoclaves and should be holding tools securely
Container should be relatively light weight and easy to transport	The width of the container (where arm grabs) should be at most 80mm	The tools should be sterilized at the end of the process
Robotic arm should be able to transfer equipment accurately without much delay	Container should allow enough gas to enter for tools to be sterilized	Program must be able to recognize which container goes into which autoclave
Container should be durable and minimize damage from arm and autoclave environment	Tool must be able to enter and exit the container (if desired)	Program must be able to recognize which tool goes into corresponding container
The container should be reusable	Every feature in the container must be greater than 4mm in size (for 3D printing)	Program should be able to open and close drawers of autoclave

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

The system should be easy to use and be able to fully sterilize surgical equipment.

3. What are the secondary functions?

Pick up
Securely transfer
Hold tools

MILESTONE 1 (STAGE 3) – MORPHOLOGICAL ANALYSIS

Team Number: Tues-23

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	Grab from the side	Lift container from bottom	Bring toward autoclave	Indents that allow easy grip	Curved container for gripping	Grippy sides on container
Carry tools in container	Secure lid	The inside of the container has the shape of the tool	Small/ tight container that does not allow movement	Grippy interior	Single slot that restricts movement	Lay down tool horizontally inside container
Sterilization	Vents on container	Mesh around container	Open top	Sealed autoclave	Intake/outtake fans	Large surface area to contact disinfectant

MILESTONE 1 (STAGE 4) – CONCEPT SKETCHES

Team Number: Tues-23

Complete this worksheet *after* having completed stage 3 as a team **and** after having **individually** created your concept sketches.

1. Each team member should copy-and-paste the photo of their individual concept sketches in the space indicated on the following pages
 - The photo's should be the same one you included in the **Milestone One Individual Worksheets** document
 - Be sure to include your **Team Number** on each page
 - Be sure each team member's **Name** and **MacID** are included with each sketch

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 sketch with the **Milestone One Individual Worksheets** document so that it can be **graded**
- Compiling your individual work into this **Milestone One Team Worksheets** document allows you to readily access your team member's work

Name: Aldraech Liac

MacID: liaca

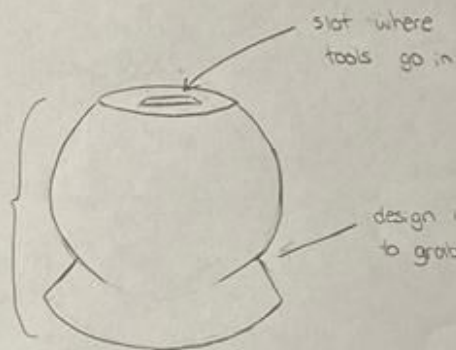


- Easy to grab considering 2 fingers, arm will clamp down on the indents.



- slot at the top allows for tool to go in

The circular design allows better fit in arm.



- material is resistant to heat and rusting.

TUES 23

liaca

Aldraech Liac

$$Q = \frac{kx^2}{2} - (mgx - F_s(d))$$

$$= \frac{kx^2}{2} - (mgx - F_s(d))$$

$$= \frac{(1320)(0.113)^2}{2} - (1.7684 + 0.3472m)$$

$$4.01m$$

$$1.825 = \frac{1}{2} I \omega^2$$

$$1.825(2.1) = \frac{1}{2} I \omega^2$$

$$3.8325 = I \omega^2$$

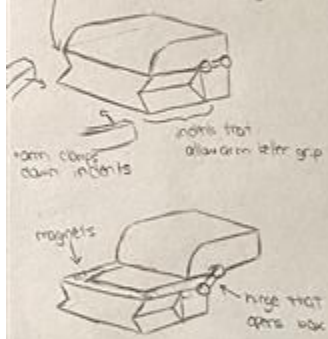
$$I = \frac{3.8325}{\omega^2}$$

$$I = \frac{3.8325}{(2\pi)^2}$$

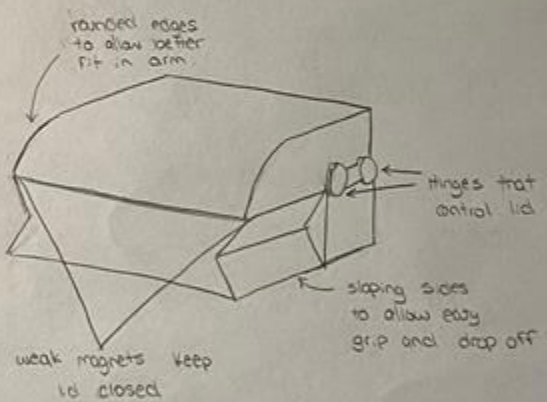
$$I = 0.15$$

$$= 29.714 \text{ kg}$$

ports are sloping so box can be released from arm grip relatively easy.



- Box is made of rust resistant material
- Material is heat resistant



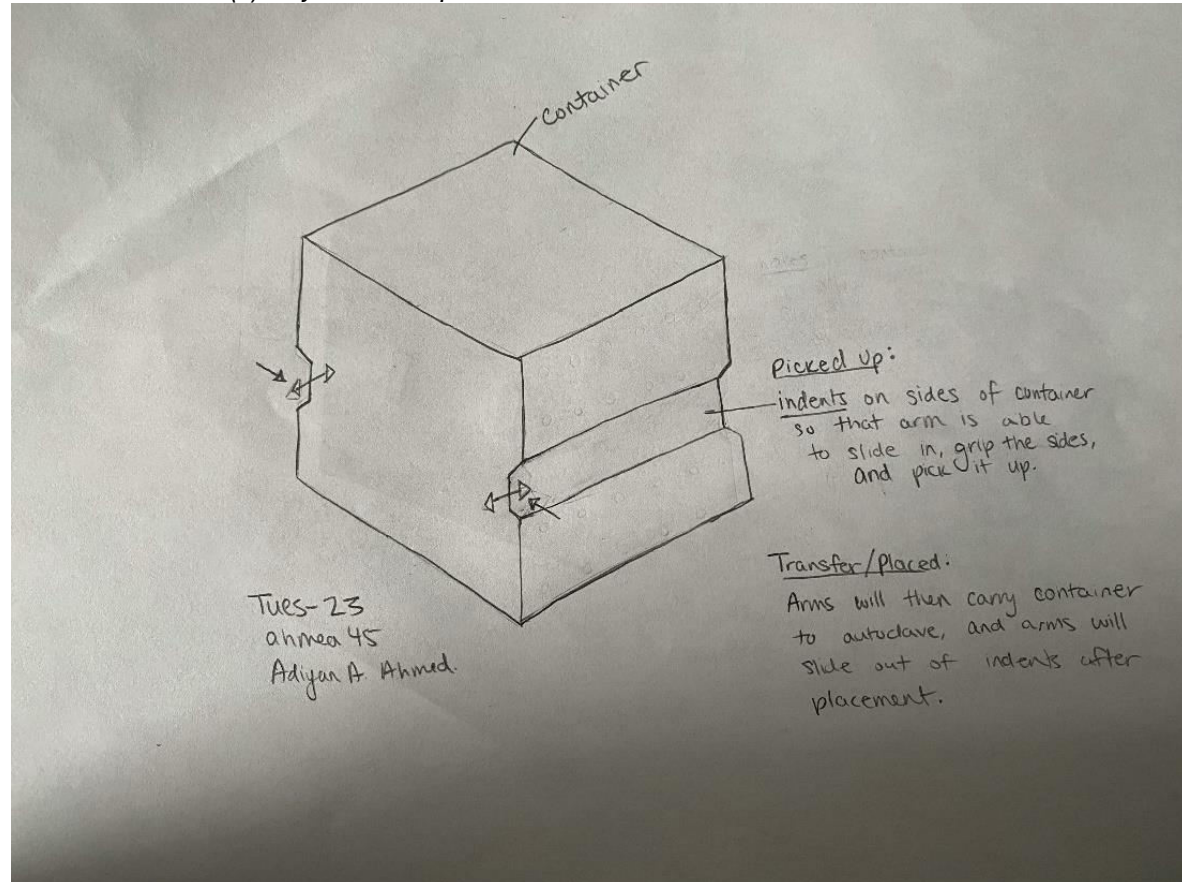
TUES 23
11:00a
Alderson IAC

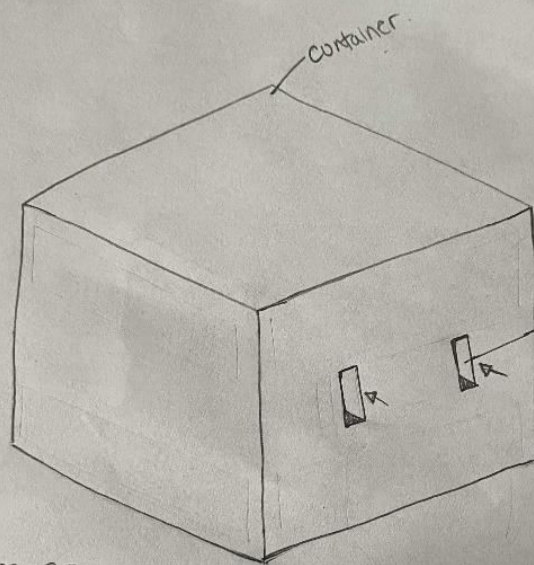
Team Number: Tues-23

Name: Adiyah Ahmed

MacID: ahmea45

Insert screenshot(s) of your concept sketches below





Pick Up:

Slots (2), for robotic arms to go into and lift up the box instead of gripping from sides

Transfer/Placed:

Arms will lift up container after entering slots, and transfer to autoclave by moving, and arms will slide out of slots after placement

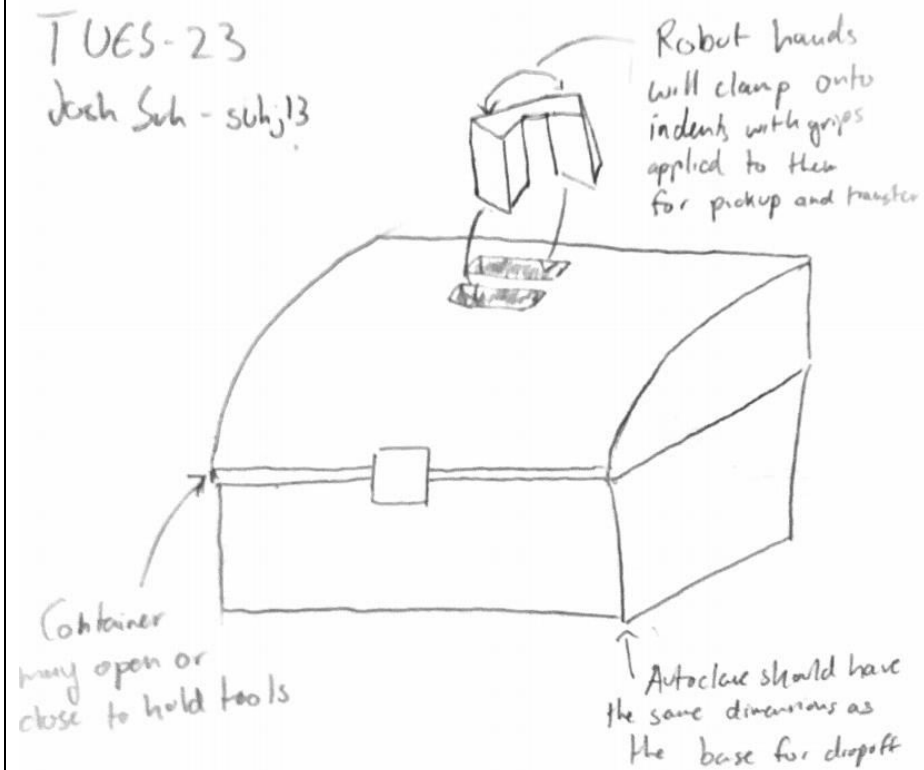
Tues-23.
ahmea45
Adiyan A. Ahmed.

Team Number: **Tues-23**

Name: Josh Suh

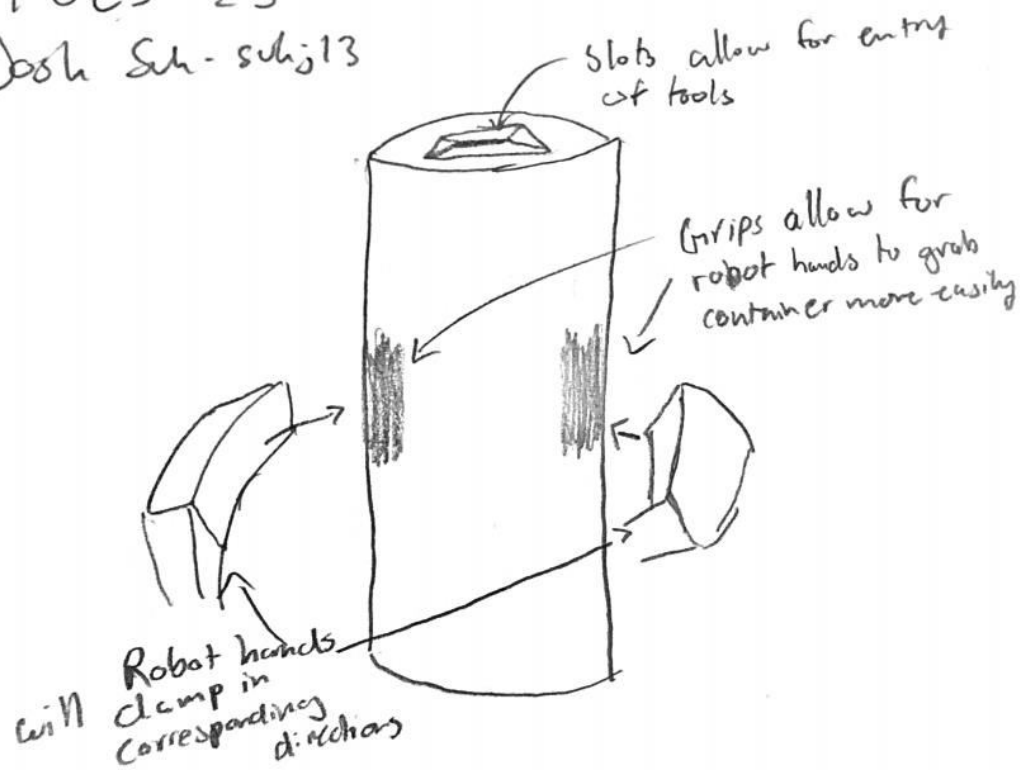
MacID: suhj13

Insert screenshot(s) of your concept sketches below



TUES-23

Josh Sch-sch13



Team Number: Tues-23

Name: Borna Sadeghi

MacID: sadegb1



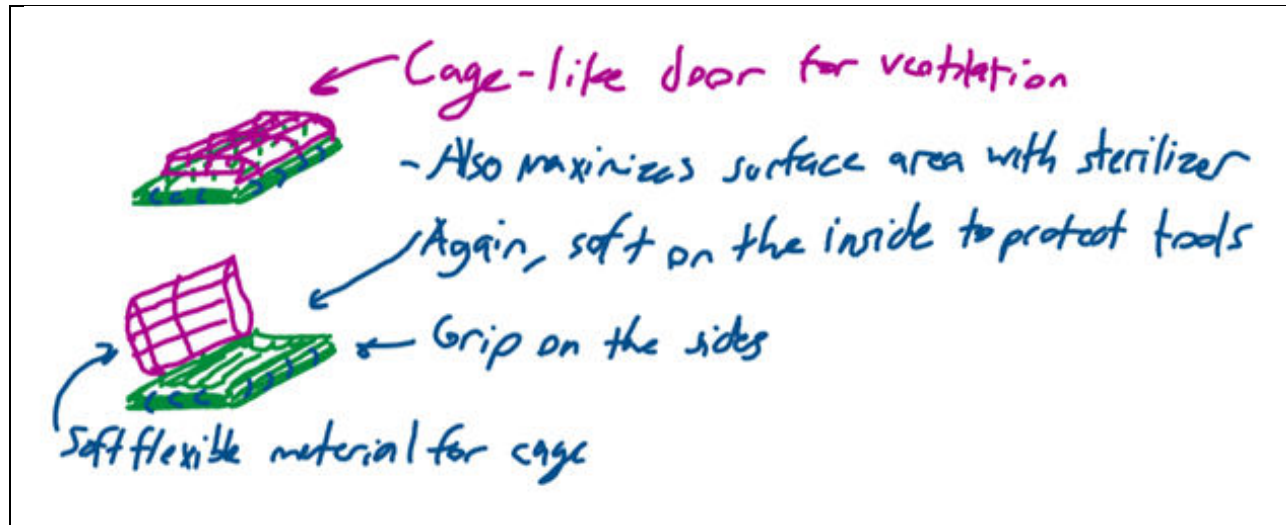
Grippy sides



Soft inside to protect tools

← Hinged, ventilated door with lock

- Made of durable material
- Resistant to oxidizing/rusting
- Large enough to fit tools



*If you are in a team of 5, please copy and paste the above on a new page