

# DumpIt

## **INTRODUCTION**

Earlier, weights were lifted using pulleys, levers, block and tackles etc. These manual or mechanical methods of operation had several limitations. They also involved huge manpower and prolonged working hours for a peculiar job. As the population and technology increased exponentially, the demand for quicker and easier to operate equipment increased. To cater to this need, hydraulic machines were introduced.

## **PROBLEM STATEMENT**

Build a locomotive, mobile syringe actuated mechanical bot, capable of scooping up loose aggregates placed at different places in the arena and dump them in the respective box. Three different layers of aggregates each of **length 50 cm, width 15 cm and height 5 cm, and 60 cm** apart will be provided in the arena. The first layer will have particles of size  **$S_1 < 2.36 \text{ mm}$** , the second layer will have particles of size  **$4.75 \text{ mm} < S_2 < 10 \text{ mm}$**  and the third layer will have particles of size  **$20 \text{ mm} < S_3 < 40 \text{ mm}$** . All the dimensions and the arrangement are shown in the figures below.

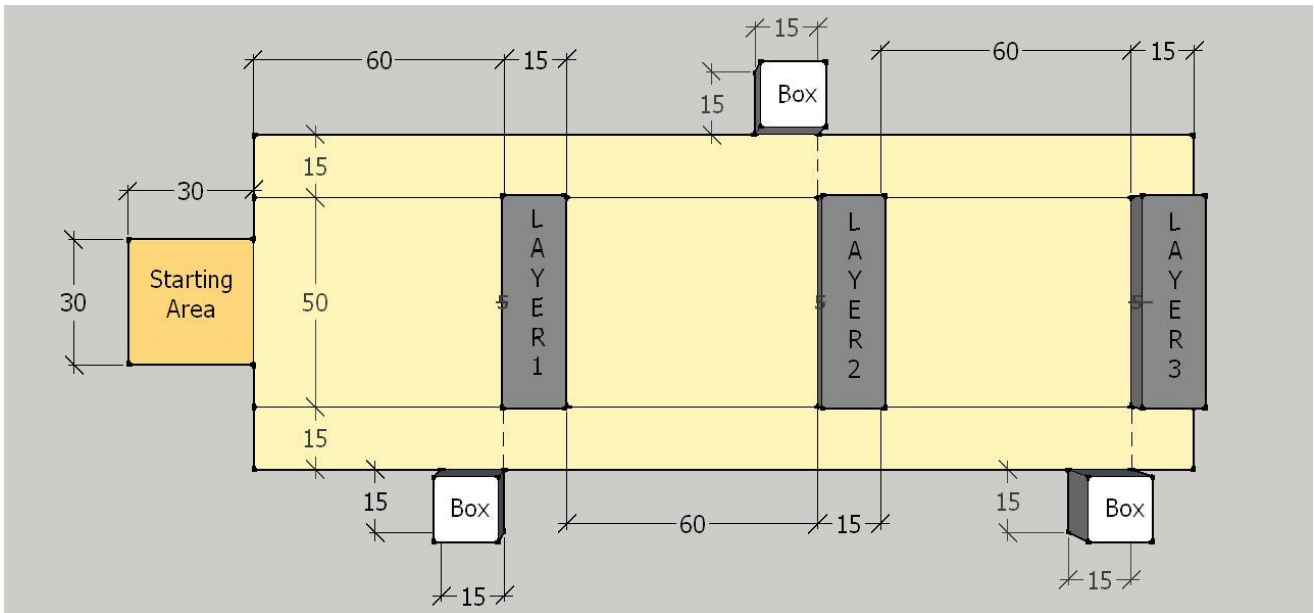
## **TASK**

1. The bot will start from the Starting Area.
2. The bot has to scoop and dump maximum possible amount of aggregates in the boxes placed in dumping zone from all the three layers within the given time frame.
3. The scooped aggregates from each layer have to be dumped into the respective box.

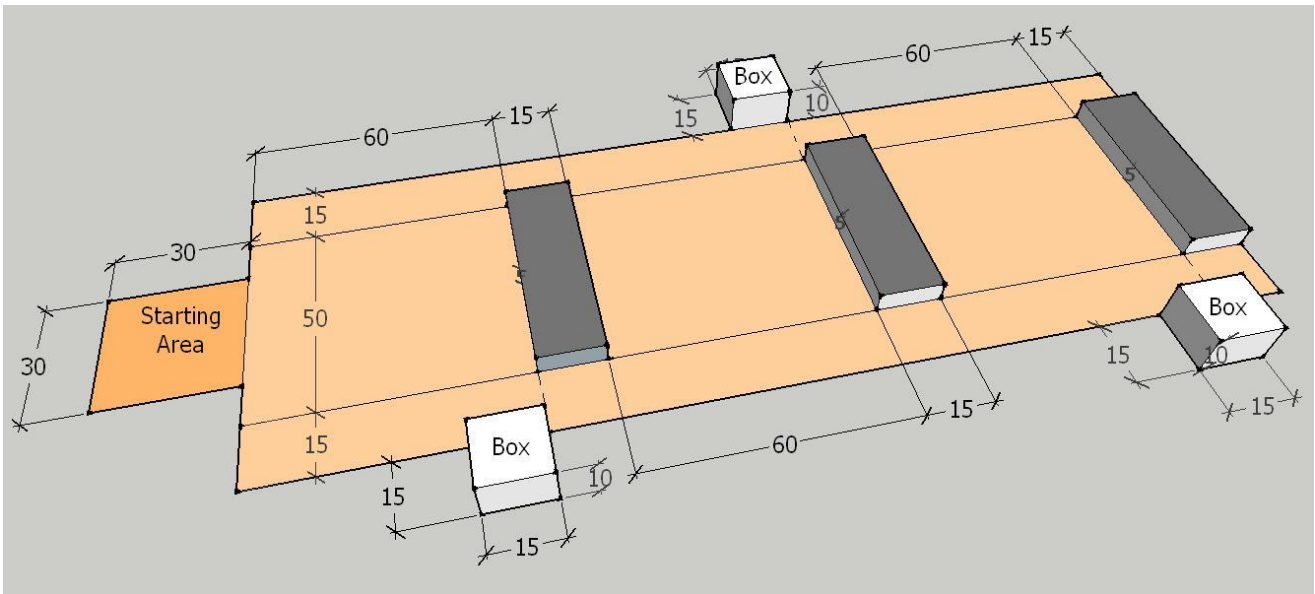
## **Specifications for Bot**

1. The dimensions of the base of the bot should not exceed **30 cm x 30 cm**. However, there is no restraint on the height and weight of the bot.
2. The bot should function only on hydraulic forces except for the locomotion for which electronic components may be used (It can be wired or non - wired).
3. The participants will only be provided with **220 volts, 50 Hz standard AC** supply, to be used only for the locomotion of bot. Participants will themselves have to arrange for any other power supply required for their robot.

**Top view:-**



**Isometric view:-**



**All the dimensions are in 'cm'.**

**Dimensions of boxes =  $15 \times 15 \times 10 \text{ cm}^3$**

**Dimensions of layers =  $50 \times 15 \times 5 \text{ cm}^3$**

## **SPECIFIC RULES**

1. Only the aggregates dumped into the boxes will be accounted for scoring.
2. The bot should not touch the aggregates of the next layer, unless it has completely crossed the previous layer (For e.g. To scoop up the aggregates from 2<sup>nd</sup> layer, the bot should completely cross the first layer area).
3. To cross the first layer, the bot has to scoop a minimum of **800g** of aggregates from the first layer and to cross over the second layer it has to scoop a minimum of **500g** of aggregates from the second layer.
4. **Once the bot crosses any layer, it is not allowed to scoop aggregates from the crossed layer. Doing so will result in the disqualification of the team.**
5. Each team can have a maximum of 5 and a minimum of 3 members.
6. Each team can only have **2 timeouts of 2 minutes** each.
7. Each team can have a maximum of **1 restart** which will be permitted only if asked before crossing the first layer of aggregates.
8. If the bot topples, the participants can place it back in the correct position and continue the task. There will not be any penalty for this, although the time will keep running during this course.
9. In case of a tie, extra time of 2 minutes will be given. The team with maximum points will be declared the winner.
10. **Maximum time for the completion of task: 10 minutes.** No extra time would be given.
11. **The decision of the NIRMAAN Team shall be final and binding.**

## **SCORING**

The scoring will be completely on the basis of weight of aggregates filled in the boxes within the given time frame.

$$\text{Points Awarded} = W_1 + 2*W_2 + 4*W_3 - R*300 - T*150$$

**W<sub>1</sub>** = Weight of aggregates in grams in Box 1

**W<sub>2</sub>** = Weight of aggregates in grams in Box 2

**W<sub>3</sub>** = Weight of aggregates in grams in Box 3

**T** = No. of timeouts

**R** = No. of Restarts

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