

Task to perform

1. At the start of the game manual bot must carry autonomous bot. The autonomous bot must not be in any kind of motion during this time and should not touch the ground.
2. Manual bot will start from starting area (yellow area) and then drop the autonomous bot in the red area (see figure 1). After dropping autonomous bot, manual bot cannot proceed to the next task until autonomous bot keeps the money block in the deposition area (blue area).
3. Autonomous bot has to solve the grid by avoiding the nodes and must carry the money block from a location on the grid to the deposition area (blue area).
4. After the money block is deposited by autonomous bot, the manual bot will pick up the money block and bank it in the common zone (pink area).
5. Then the manual bot will pick up the key block from the common zone and place it in the key deposition area (Transfer zone shown in green).
6. During this whole time the autonomous bot has to wait till the manual bot delivers the key block in the Transfer zone.
7. Autonomous bot will carry key block to the key installation location (orange area) to unlock the treasure.

*The team which completes the task with maximum points will be the winner.

*In case no team finishes the task, team with highest points will be the winner. To evaluate in this case differential marking has been done at various checkpoints.

*In case of a tie, the team who has taken least time will be the winner.

Arena Details

The arena will consist of the following parts:

1. **Grid:** It is indicated in black and white colour in figure 1. This zone will consist of a **6x 6** squares grid of white lines on a black surface. The lines will be equally spaced. Each cell of the grid will be a square with inner dimensions **270 mm x 270 mm**. The thickness of each white line is **30 mm**.
2. **Manual Zone:** Manual Zone is indicated by wooden pattern as shown in the figure. Manual bot is restricted to the manual zone.
3. **Common Zone:** It is area common between two manual zones where the „key“ blocks and assembly blocks(individual units) are kept. Shown by violet colour. One half is for deposition of money block and on the other half key block is kept.
4. **Transfer Zone:** -It is the zone where manual bot deposits the key block and autonomous bot picks it as shown in the figure. Location where money block has to be deposited by autonomous bot is fixed and is shown in figure (blue area). There are three locations to deposit Exact locations where manual bot would be required to deposit key block will vary and are not fixed. They will be declared just before the

start of match and at other two locations dummy block will be placed to confuse the autonomous bot.

5. **Components in the arena:** A “Block” will be of **100 mm x 100 mm x 100 mm**. There will be 2 types of blocks:

Block Type A or Money - The colour of all the 6 sides of the block will be white. 1 such blocks will be placed randomly in the grid. The block will be placed such that it coincides with the centre point of a grid intersection as closely as possible
Dimensions - **100 mm x 100 mm x 100 mm**.

Block Type B or Key – The colour of 5 sides of block are black and one side of block is white. The block will be placed in common zone such that its white face is towards floor. Dimensions - **100 mm x 100 mm x 100 mm**.

The blocks are made of non-magnetic material and will have a maximum weight of **60 grams**. The pictures of the blocks are given below.

6. The dimensions of the arena would be accurate to within 5% or 20 mm, whichever is less. Assembly joints on the arena floor will not involve steps greater than 0.5 mm.
7. Light conditions at the venue might not be uniform. 9. Figure 1 has been coloured just to specify the various zones.

Bot Specifications Dimensions and Fabrication

Autonomous Bot

1. Only one autonomous grid solving bot per team is allowed.
2. The top view of each autonomous bot must fit within a square of dimensions **220mm x 220mm** (l x b).
3. Bot must be started individually by only 1 onboard switch. However, a team may have a separate on-board switch for restart. This switch will have to be shown before the run to the organisers.
4. The autonomous bot must be stable and must be able to stand on its own at the beginning of the run when put in the red area. Bots not fulfilling this criterion will be disqualified.
5. During the run, the autonomous bot can expand itself provided it does not damage the arena in anyway. However, it is not allowed to leave anything behind or make any marks while traversing the grid. All bots found damaging the arena will be immediately disqualified. The final decision is at the discretion of the organisers.
6. The autonomous bot should not separate or split into two or more units. All bots/units which are touching each other or are in the starting point will be considered as one bot.
7. The methods of collection and delivery of the blocks are at the discretion of the builder.
8. However, the teams damaging the blocks will be disqualified. **The teams are allowed to use ready-made micro-controller boards/ready-made sensor kits. However the teams are not allowed to use ready made lego kits or any such assemblies.**
9. The starting procedure of the bot should be simple and should not involve giving bot any manual force or impulse in any direction

Manual Bot:-

1. . Only 1 manual bot per team is allowed.
2. During the start of the run the manual bot must fit within a cube of dimension **400mm x 400 mm x 400 mm** (l x b x h).
3. The bot must be stable and must stand on its own at the beginning of the run when put in the starting point. Bots not fulfilling this criterion will be disqualified. The bot is only allowed to keep autonomous bot inside it and there should be no separate part of manual bot splitting up from it.
4. Manual bot should be wired remote controlled.
5. Manual bot should have onboard power supply.
6. The external remote control used to control the bot is not included in this size constraint.
7. The onboard power supply on the bot must fit within this size constraint.
8. Manual bot cannot be constructed using readymade Lego kits or any readymade mechanism. But you can make use of readymade gear assemblies. Violating this clause will lead to the disqualification of the team.
9. Manual bot is only allowed to move in manual zone.

Power Supply and Propulsion

1. The bots have to use an on-board power supply. No external power supply will be allowed.
2. Each team shall bring its own power supply for all its bots.
3. The potential difference between any two points on any of the bots must not exceed **12 V DC**.

Controls

1. The grid solving autonomous bot should not receive any input from outside the arena.
2. The manual bot should receive signal only from single wired remote control.
3. No wireless communication between autonomous bot and manual bot is allowed. The team is responsible for proving this to the organisers

Rules

Game Rules NOTE - The teams will have to submit their grid solving bot before the start of the competition. Only those teams which submit their grid solving bot will be allowed to participate.

The grid solving bot will be handed back to the team during the time of their run. They will be given 2 minutes to do any hardware changes if they wish. Under no circumstances will they be allowed to make changes in their code.

- The maximum time given for completing the task is **6 minutes**.
- Before the start of the run, a **dry run of 5 minutes** will be given to the grid solving bot. During dry run the grid solving bot can explore the entire maze to find the position of the nodes and positions where the key block and the assembly will be placed. Indications will be given at locations where key block will be deposited by manual bot in the form shown in figure below(autonomous dry run arena). During the dry run dummy blocks won't be present on the arena.
- The bot should give a visual/audio signal at the end of dry run.

- If the time for the dry run exceeds 5 minutes, then the extra time taken for dry run will be deducted from the allotted run time of 6 minutes. No advantage will be given if the dry run ends before 5 minutes.
- At the end of dry run the bot will be placed at the starting point.
- **Type A** block (money block kept at arbitrary location in the grid) have to be deposited in the money deposit zone/cell by the autonomous bot.
- **Type B** block (key) has to be first lifted from common zone and kept in the transfer zone. The orientations of block will be such that its white face is towards floor. So for autonomous bot to detect the key block manual bot will have to turn it and place it at the key deposition area in the transfer zone. Please note that the Type B block can be touched by the manual bot only when the Type A block has been moved out of the grid and placed at the money collection cell/zone.
- If any part of the block is in contact with the autonomous bot, the autonomous bot is said to carry that block.
- During the run, every bot can carry only one block.
- **During the run if any block gets displaced from its original location and lies somewhere else in the grid or central zone, it will be picked up and put back to any other random grid point.**

Checkpoints for autonomous bot:-

First Checkpoint - Once autonomous bot successfully enters the grid area from manual bot.

Second Checkpoint - Once the autonomous bot successfully deposits the money block in the common zone.

Third Checkpoint - Once the manual bot deposits the key block in the transfer zone.

Checkpoint for manual bot

After manual has successfully unloaded the autonomous bot, it can take a separate restart from manual starting point.

Restarts

- The teams are given 3 restarts each for every autonomous bot and the manual bot.
- However, there are no restrictions on the number of restarts for the dry run.
- If the bot carrying the block opts for a restart, then the block will be taken away, the bot will be placed back to its starting point.
- In a restart, the timer will not be set back to zero.
- During a restart for a grid solving autonomous bot, the bot will have to be restarted by putting it back in the grid starting point.
- During restarts for autonomous bot, a contestant cannot feed information about the grid to the bot. However, contestants are allowed to: Adjust sensors (Gain, Position etc.), make repairs. However, a contestant may not alter a bot in a manner that alters its weight (e.g. removal of a bulky sensor array or switching to lighter batteries to get better speed). The organisers shall arbitrate.

- All restarts for autonomous bot and the manual bot require the approval of the organisers before the bot can be removed from the arena. If the bots were handled within the arena without approval, the run will be terminated.
- A block is said to be deposited if any part of the block is in contact with the block deposit zone.
- If after the checkpoint, a team opts for a restart, the blocks that have been deposited before the checkpoint(s) won't be placed back.

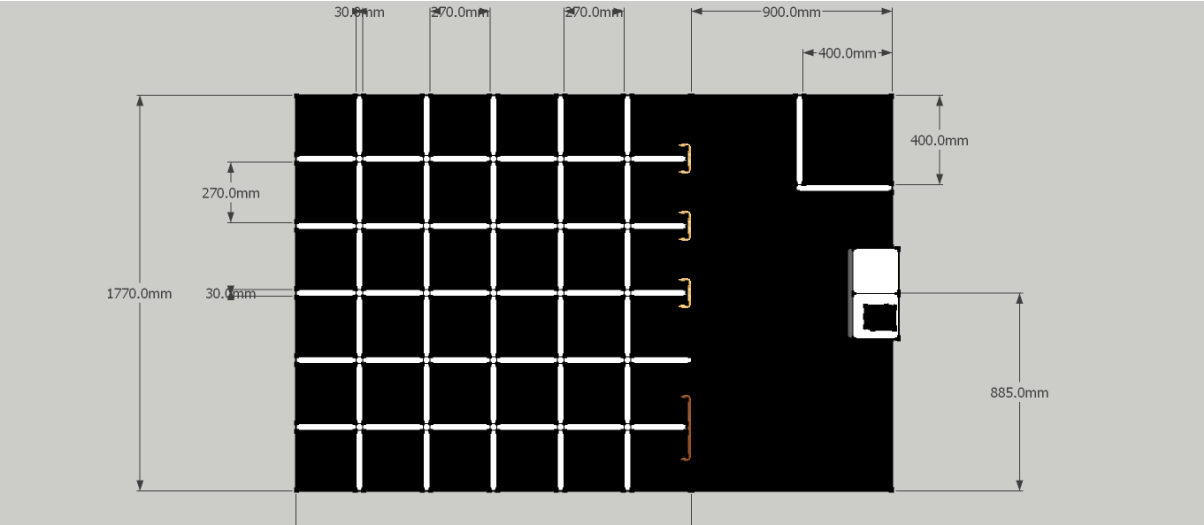
General Rules: –

Team members will not be allowed to handle the blocks. Only organisers are allowed to handle the blocks in any situation. The team will be disqualified if the blocks were handled within the arena without approval of the presiding organisers. The bot is not allowed to leave anything behind while traversing the grid. It should not make any marks on the floor of the arena. Any bot found damaging the arena will be immediately disqualified. Only two members of the team are allowed to handle the bots. Participants are not allowed to keep anything inside the arena other than the manual bot and autonomous bots. Laptops/personal computers are not allowed near the arena. Other Wi-Fi, Bluetooth, etc. devices must be switched off. The organisers hold the right to check for these devices and their usage. The organisers may stop any bot at any time if they feel that it is performing, or is about to perform, any action that is dangerous or hazardous to people or equipment. No robot is allowed to use any flammable, combustible, explosive or potentially dangerous processes. The time measured by the organisers will be final and will be used for scoring the teams. Time measured by any contestant by any other means is not acceptable for scoring. In case of any disputes/discrepancies, the organisers' decision will be final and binding. The organisers reserve the rights to change any or all of the above rules as they deem fit. Change in rules, if any will be highlighted on the website and notified to the registered teams.

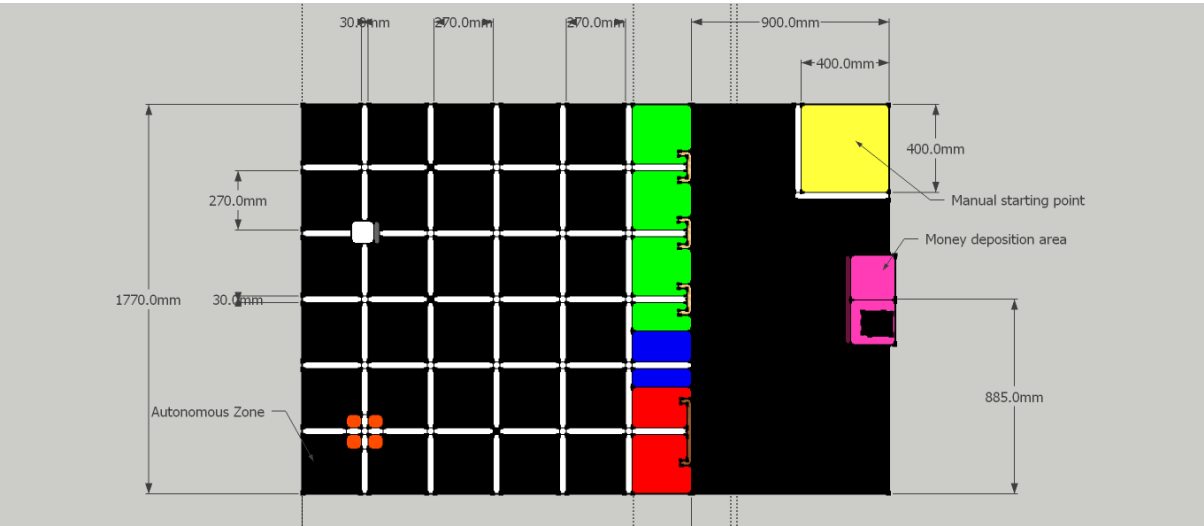
Judging Scoring System

1. Team will be awarded 40 points each for proper successful entry of autonomous bot from manual bot.
2. The team will be awarded 25 points for depositing the money block at its deposition point.
3. Team will be awarded 25 points i.e. for placing money block in the common zone.
4. Team will be awarded 30 points for proper delivery of key block from common zone to key deposition area.
5. Team will be awarded 60 points for unlocking the secure zone i.e. successfully placing key block at the unlocking area.
6. Every time the bot crosses a node, it incurs a penalty of 25 points.
7. **A team can score maximum 180 points in a game.**

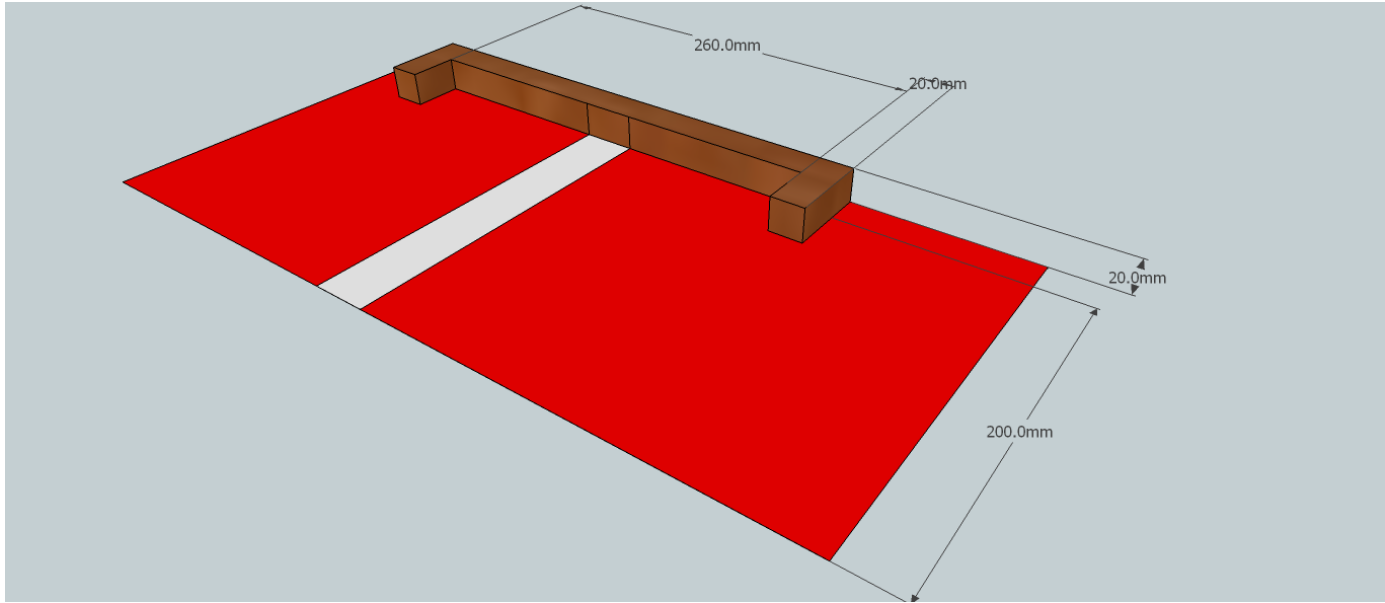
FIQURES



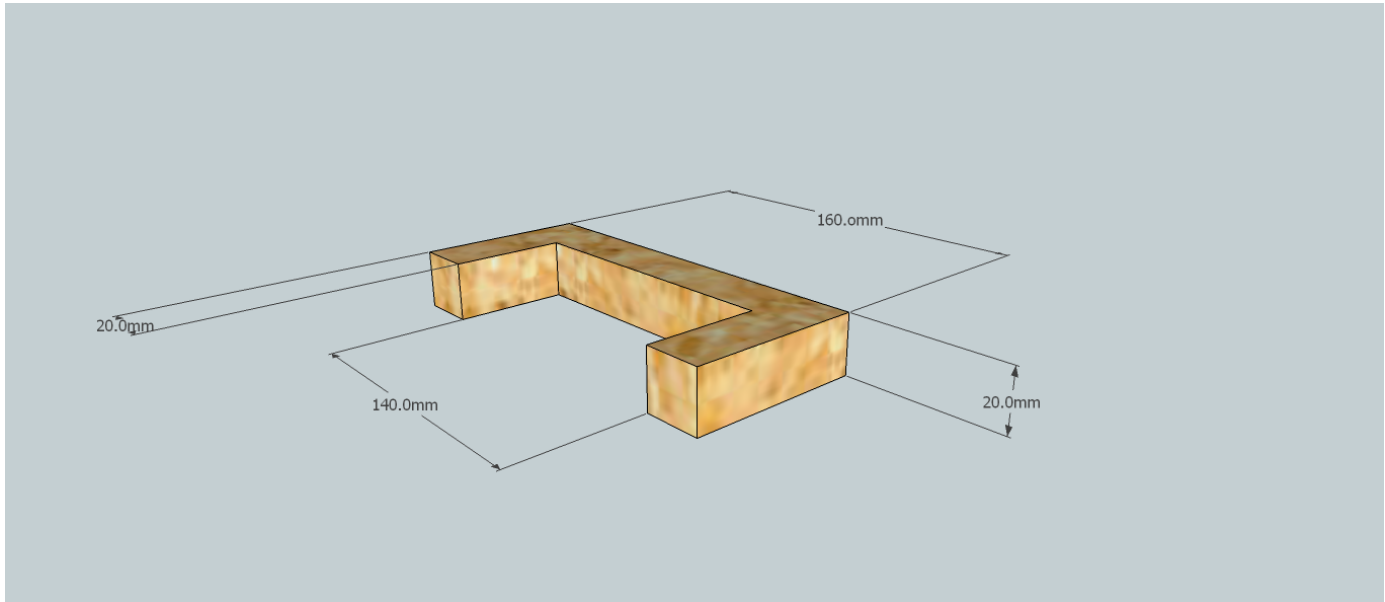
Actual arena top view



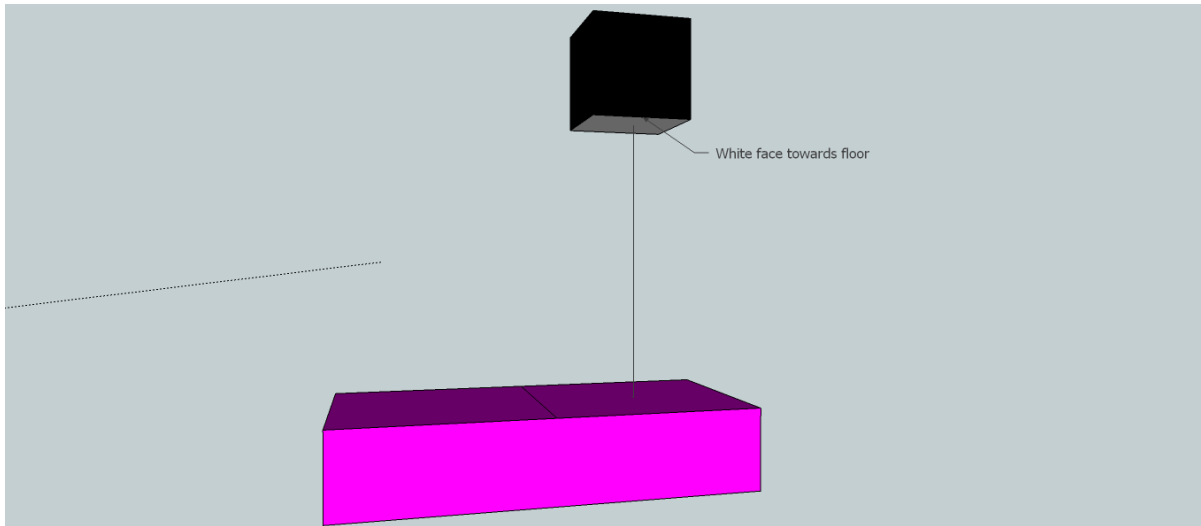
Arena top view coloured



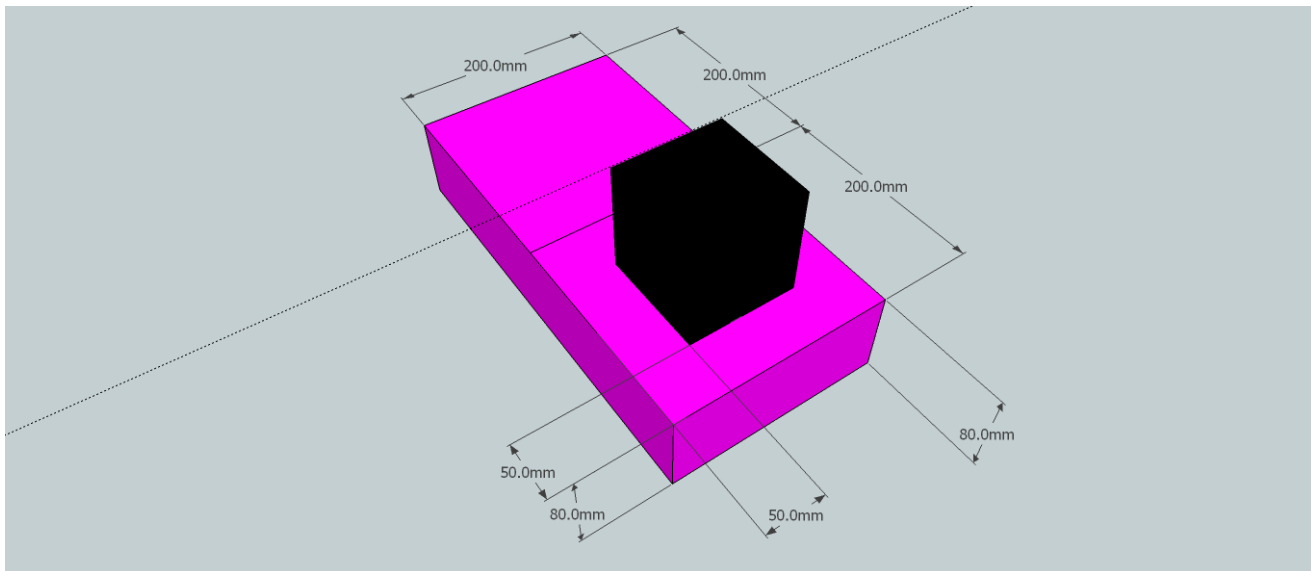
Autonomous landing point



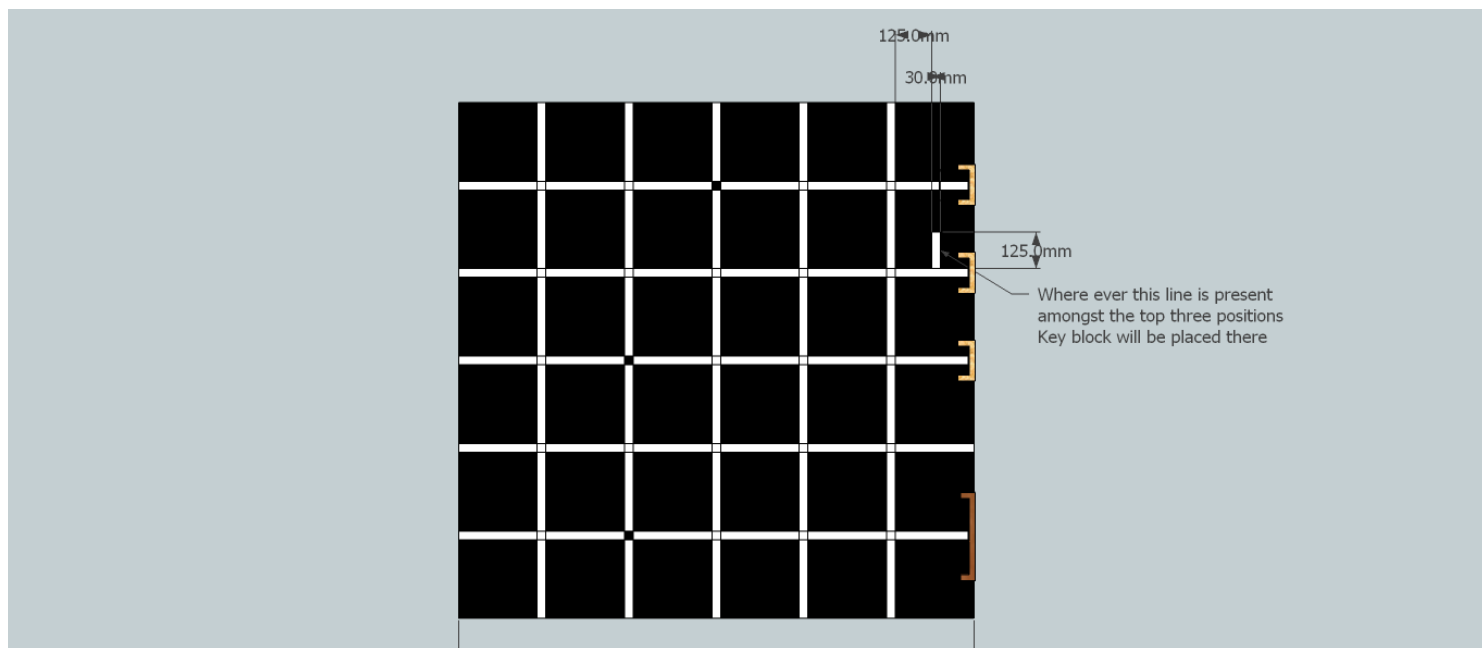
Block deposition point



Common zone block in air



Common zone isometric view



Autonomous dry run arena