MBZIRC
2020

CHALLENGE
2 TASKS

ORGANIZED BY

جامعــة خليفــة
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W W W . M B Z I R C . C O M

BRICKS

Four Types of Bricks of same cross-section (0.2mx0.2m) and different lengths (same as originally published):

|	
Red 0.3m (1.0kg)	Blue 1.2m (1.5kg)
Green 0.6m (1.0kg)	Orange 1.8m (2.0kg)

WIND RESISTANCE

• Two separate building areas: Wall 1 and Wall 2

• Wall 1 same as originally published (Figure 1), intended for assembly by UGV

• Wall 2 consist of a series of 'U' shaped channels made of Perspex to place bricks, in order to resists wind generated by UAV rotors (Figure 2), intended for assembly by UAV

• Use wind shields if required

WALL 1 - FLAT L-SHAPED BASE FOR PLACING BRICKS

- L-shaped base sitting on the ground
- Each segment of the L-shaped base has Length: 4m, Width: 0.4m, Thickness: 3mm   See Figure 1
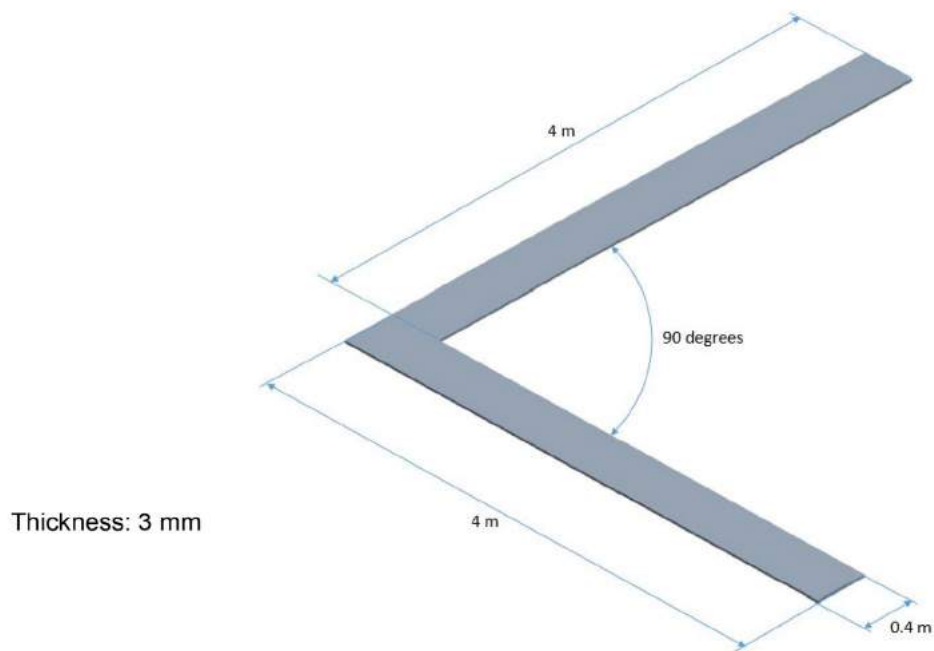

Thickness: 3 mm

Figure 1 - Wall 1

WALL 1 - FLAT L-SHAPED BASE FOR PLACING BRICKS

- One segment of L shaped base reserved for Orange Bricks (long bricks). 2 bricks per layer.
- Each layer of other segment to be a randomly generated pattern of bricks:

  - 4 Red 4x0.3
  - 2 Green 2x0.6
  - 1 Blue 1x1.2

- Wall 1 to consist of 5 layers
  20 Red bricks, 10 Green bricks, 5 Blue bricks and 10 Orange Bricks (45 bricks in total)
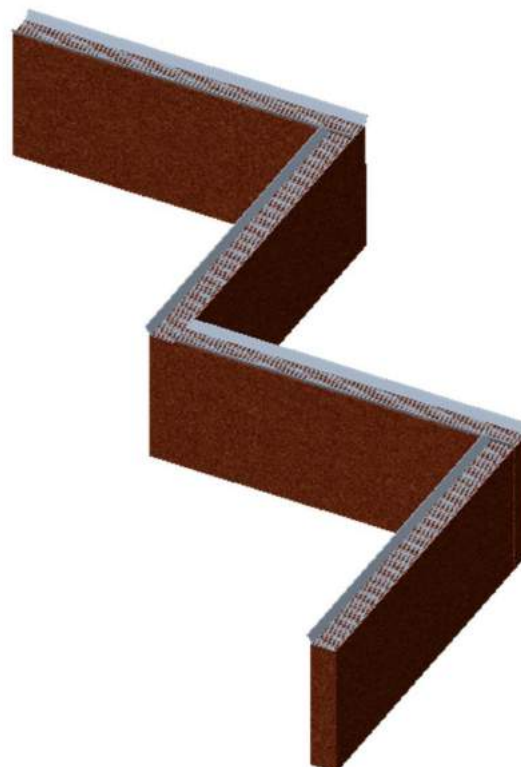
WALL 2 - U SHAPED CHANNEL FOR PLACING BRICKS

- Cross-Section: Height - 0.1m. Width - 0.4m Tapering to 0.25m
- Length: 4m
- U Channel mounted 1.7m above ground, on hollow brick façade. U channel lateral walls made of Perspex, bottom surface made of wire mesh, to reduce rotor wash disturbances, Figure 2.
- 4 Channels arranged as shown in Figure 3. The 4 Channels will sit on a movable base (not shown in Figure 3). The base will be randomly placed for each team trial.

FIGURE 2 – U SHAPED CHANNEL OF WALL 2

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channel base from metal grate / wire mesh

0.4 m

0.25 m

0.1 m

1.7 m

hollow wall

4 m

0.3 m
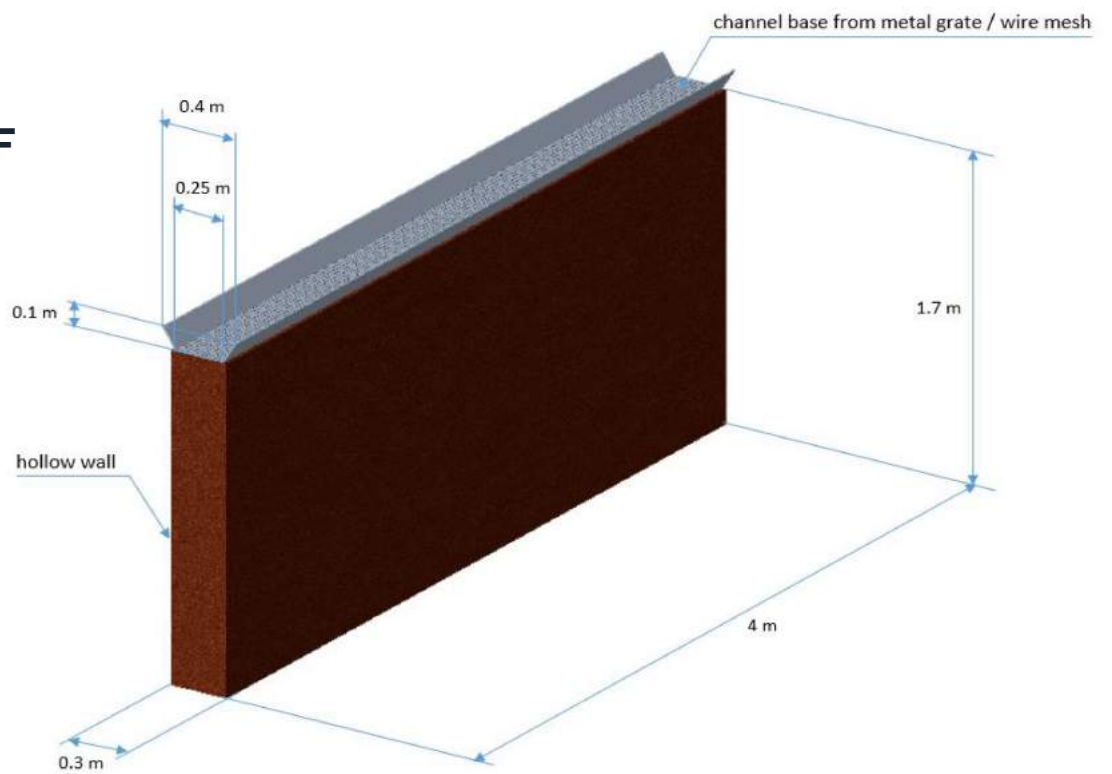
FIGURE 3 – WALL 2

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FERROMAGNETIC AREA ON BRICKS

- Teams will be able to grab the bricks using ferromagnetic plate located on one external surface of each brick – Figure 4.
- Ferromagnetic plates and made of 0.6mm thick steel sheets. Indicative dimensions are given in Figure 4.
- The color of the ferromagnetic plates will be white and different from the base color of the brick surfaces.

FIGURE 4 - FERROMAGNETIC PLATES ON BRICKS
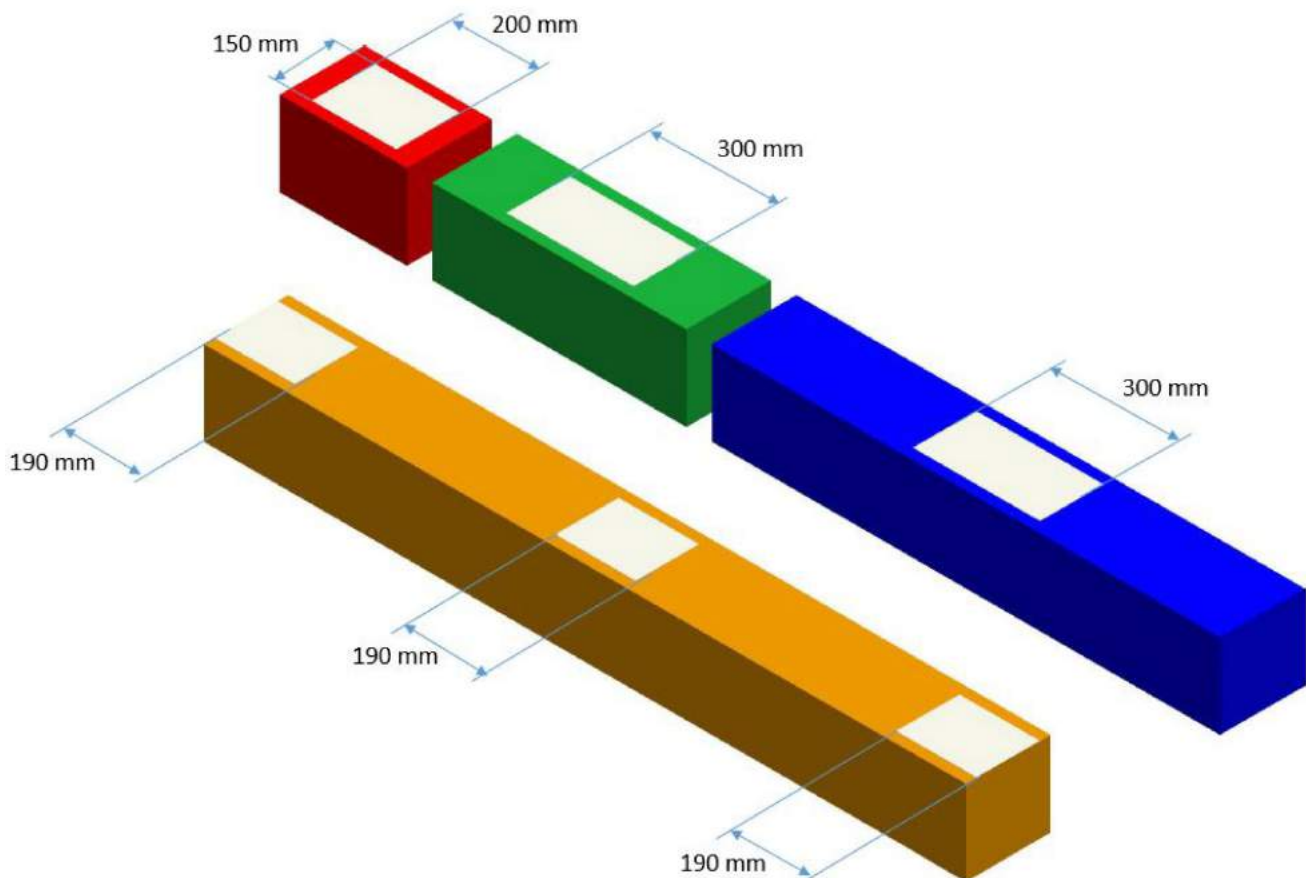
INITIAL ARRANGEMENT OF BRICKS

- The bricks will be color segregated.
- The bricks will be arranged so that the magnetic portions will be clearly visible.
- Bricks will be placed on

  (a) U Channels (to resist wind generated by UAV rotors) and

  (b) Stacked in 4 square blocks (see **Figures 5a and 5b**)

- The U channels will be of cross section Height 0.1m and Width 0.25m.

FIGURE 5A – INITIAL LAYOUT OF BRICKS ON U-CHANNELS
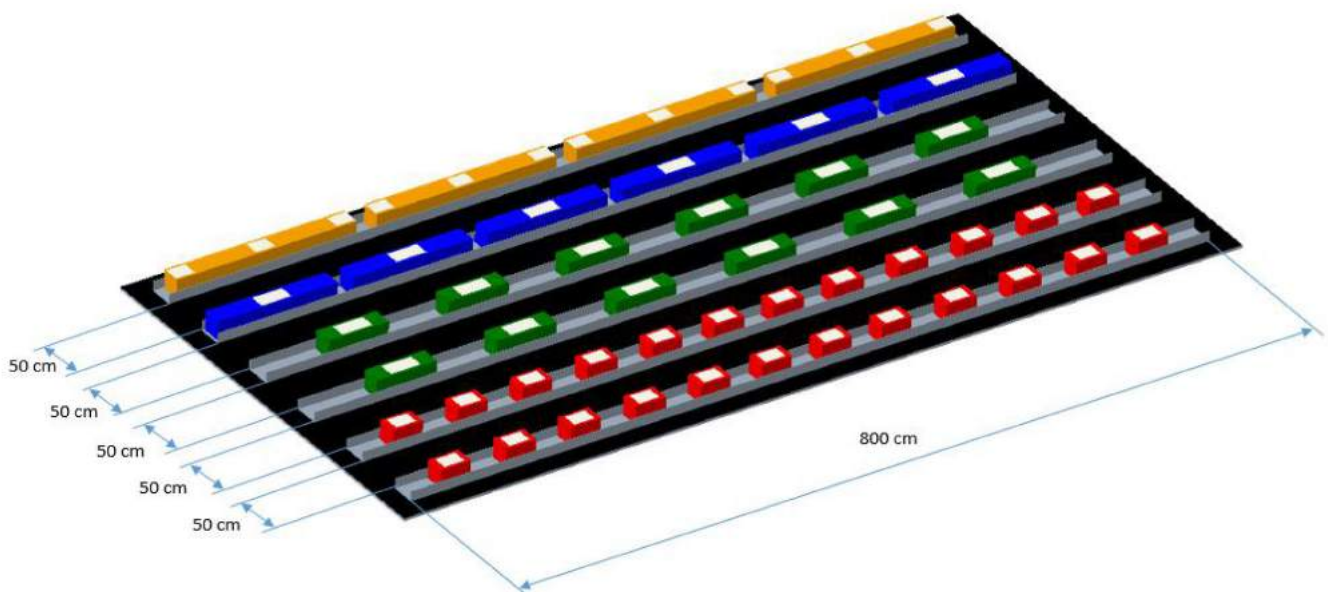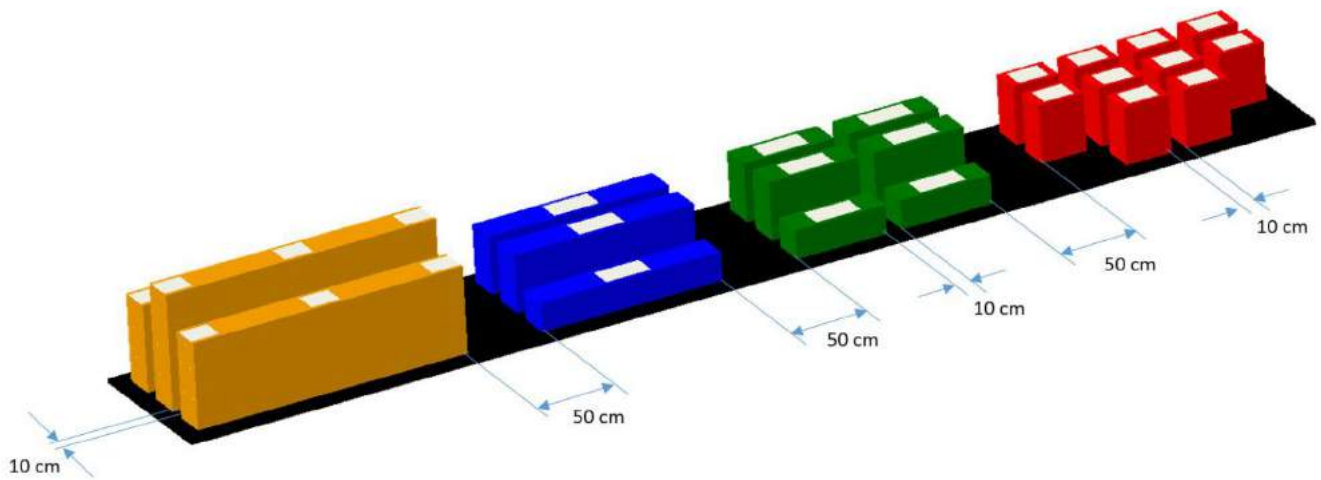
FIGURE 5B - INITIAL LAYOUT OF STACKED BRICKS

WALL PATTERN

- The wall pattern will be an alpha-numeric file with3D information.
- The pattern for each non-orange brick layer is generated by creating a random array of 7 bricks consisting of 4 red bricks, 2 green bricks and 1 blue brick.

EXAMPLE OF WALL 1 PATTERN

- Segment 1, Layer 1: BLUE RED GREEN RED GREEN RED RED
- Segment 1, Layer 2: RED GREEN RED GREEN RED RED BLUE
- Segment 1, Layer 3: RED RED GREEN RED GREEN RED BLUE
- Segment 1, Layer 4: BLUE RED RED RED GREEN RED GREEN
- Segment 1, Layer 5: RED RED GREEN RED RED BLUE GREEN
- Segment 2, Layer 1: ORANGE ORANGE
- Segment 2, Layer 2: ORANGE ORANGE
- Segment 2, Layer 3: ORANGE ORANGE
- Segment 2, Layer 4: ORANGE ORANGE
- Segment 2, Layer 5: ORANGE ORANGE

EXAMPLE OF WALL 2 PATTERN

- Channel 1, Layer 1: BLUE GREEN RED RED RED RED GREEN
- Channel 2, Layer 1: RED BLUE RED RED RED GREEN GREEN
- Channel 3, Layer 1: GREEN BLUE RED RED GREEN RED RED
- Channel 4, Layer 1: ORANGE ORANGE
- Channel 1, Layer 2: RED RED BLUE GREEN RED GREEN RED
- Channel 2, Layer 2: GREEN GREEN RED RED RED RED BLUE
- Channel 3, Layer 2: RED BLUE RED RED GREEN GREEN RED
- Channel 4, Layer 2: ORANGE ORANGE

EXAMPLE OF CODE FOR GENERATING WALL PATTERNS - 1

Scilab code for generating a random sequence of bricks, from a set of 7 bricks, 4 of them 30 cm long (RED), 2 of them 60 cm long (GREEN) and 1 of them 120 cm long (BLUE).

```
clear
N_30=4;
N_60=2;
N_120=1;
seq=[];
out=0;
while out == 0
m=rand()*(N_30+N_60+N_120);
if m < N_30 then
seq=[seq 30];
N_30=N_30-1;
elseif m < N_30+N_60 then
seq=[seq 60];
N_60=N_60-1;
else
seq=[seq 120];
N_120=N_120-1;
end
if sum(seq) == 360 then
out=1;
end
end
disp(seq) //shows the sequence
```

THANK YOU