# WALL CLIMBING ROBOT RACE

## 1. OBJECTIVE

The aim of this event is for mobile robots to demonstrate their horizontal and vertical surface climbing abilities during a race.

## 2. THE COMPETITION ENVIRONMENT

2.1 The wall is shown in Figure 1. It consists of three sections: a two metres long horizontal section (section A) on the ground followed by a two metres high vertical section (section B) followed by a two metres long horizontal section (section C) at the top, with each section at least 0.8 metre wide. The following tolerance will applied:

(a) length of each wall section should be 2000 mm ± 5 mm.
(b) angle formed between two adjacent wall sections should be 90° ± 0.5°.

The wall will be deemed to have satisfied criteria (a) and (b) above and be considered fit for use if each of the two distances between diagonally opposite corners (using the side view in Figure 1) lies in the range 2733 mm to 2847 mm.

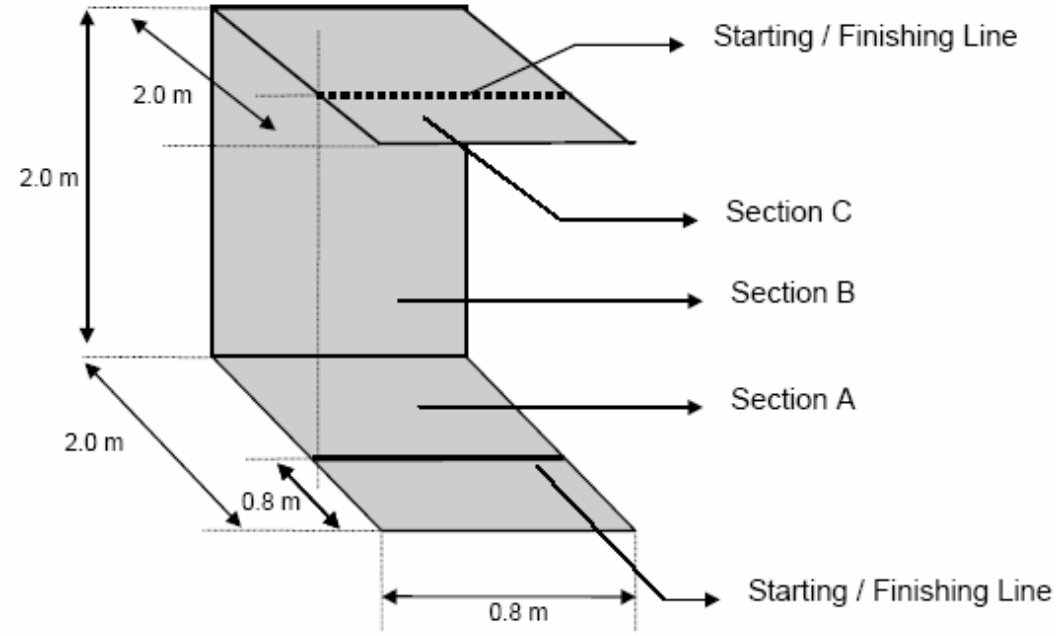


Figure 1: The wall for the wall-climbing robot race

2.2 The vertical wall section (Section B) will be covered with a transparent Polycarbonate sheet with thickness ranging between 10 to 15 mm. The 2 horizontal top (Section C) and bottom (Section A) walls will be covered with metal sheets having matt black surface finish.

2.3 Starting / finishing white lines will be located 0.8 metre from the edge of the horizontal section (section A and C.)

2.4 The supporting structure for the wall will have provision for two safety cables to be attached to the robot so that both cables can be used simultaneously during the race (not shown in Figure 1.)

## 3. THE COMPETITION

3.1 Robots will start from a stationary position with the front-most part of the robot lying within a 0.05 m deep starting zone demarcated by the inner edges of the two lines positioned across wall section A on the ground. (see Figure 2.)

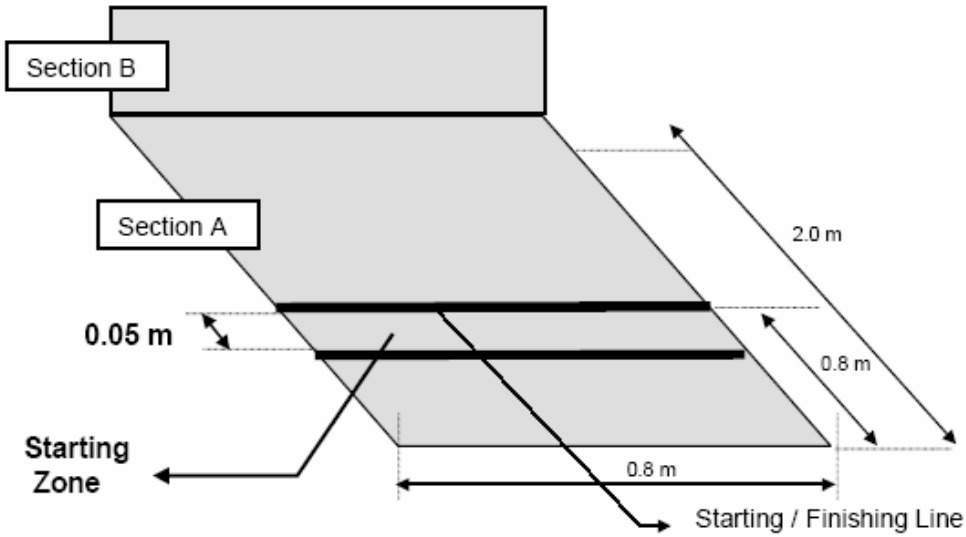


Figure 2: The starting zone for the wall-climbing robot race viewed from above wall-section A

3.2 On reaching the vertical section (section B) the robots shall climb up the vertical section and subsequently climb 'upside-down' to the end of the top horizontal section (section C.)

When the trailing end of the robot crosses the finishing line, the robot shall climb back through sections C, B and A in sequence. The sequence of wall sections to be climbed from start to finish is A-B-C-C-B-A.

3.3 The robot that completes the entire sequence of wall sections according to paragraph 3.2 in the least time and in accordance with all the rules wins.

3.4 All robots are to be fully autonomous and self contained with their own power supply, control and intelligence built-in within the robot itself.

3.5 No human interference is allowed after the cage-in and during the run.

3.6 A robot is deemed to have started once any part of the robot crosses the starting line in the wall section A.

3.7 A robot is deemed to have completed its climb through a particular wall section when it fulfils all of the following conditions (a), (b) and (c) in sequence:

(a) robot touches the wall section that it is about to complete;

(b) robot simultaneously touches both the wall section that it is about to complete as well as the next wall section in the sequence of wall sections that is consistent with its direction of travel; and

(c) robot ceases to touch the particular wall section that it is about to complete and touches the next wall section in the sequence that is consistent with its intended direction of travel.

The above conditions apply to all wall sections except in the following cases:

(i) when the robot completes its climb through the wall section C for the first time in the sequence according to paragraph 3.2; and

(ii) when the robot completes the last wall section (wall section A) in the sequence according to paragraph 3.2.

In both cases (i) and (ii), the robot is deemed to have completed its climb through the wall section only when the entire robot has crossed the finishing line placed within that particular wall section.

3.8 Each team shall be given a maximum of **10** minutes to produce its best result once the robot is removed from the caging area.

3.9 After the race begins, any physical handling of the robot such as touching, pulling of cables or pushing of the robot during a climb will disqualify the result of that climb. However if a robot falls off while climbing the wall, using the safety cables to break the fall of the robot is allowed and the result of the climb will be determined as specified in paragraph 3.3 & 3.4.

## 4. THE ROBOTS

4.1 The dimensions of each of the competing robots must not exceed 0.75 metre in length and height, and 0.6 metre in width at all times while the robot is in operation.

4.2 The weight of each of the competing robots must not exceed 10 kilograms.

4.3 Competing robots must not have parts removed or added to them during the competition except for replacement of batteries or for repairs essential to the operation of the robot. The competing robots are not allowed to discard any part of their chassis during operation. The competing robots must not use chemical or combustion power methods.

4.4 The competing robots must not damage the competition environment including the wall and its supporting structure and the sensors in any way.

4.5 The competing robots must not endanger the judges and the spectators in any way. All competing robots must be firmly secured with two safety cables at all times during operation.

4.6 A robot will be disqualified during the competition if it endangers the judges, the participants or the spectators in any way during the competition, or if it damages the competition environment. Alternatively a robot may be banned from competing if, in the opinion of the judges, it is likely to pose a safety hazard or cause damage to the competition environment.

## 5. CLONING

5.1 In accordance with the spirit of the competition, clones among the winning entries will only be awarded one prize. Clones will be identified during the "caging" procedure.

5.2 Clones will be identified by the working principles of the whole robotic system, such as the sequence of operations and negotiating the wall bends.

5.3 When in doubt, the decision of the Judges will be final.