

# U-ROCK2023

UNIVERSITY ROBOT COMPETITION: KINGDOM OF CHAMPIONS

Organize by  
Jabatan Pendidikan Tinggi (JPT)  
Kementerian Pendidikan Tinggi (KPT)  
Universiti Malaysia Perlis

## ROPE CLIMBING ROBOT CHALLENGE

### RULES & REGULATION



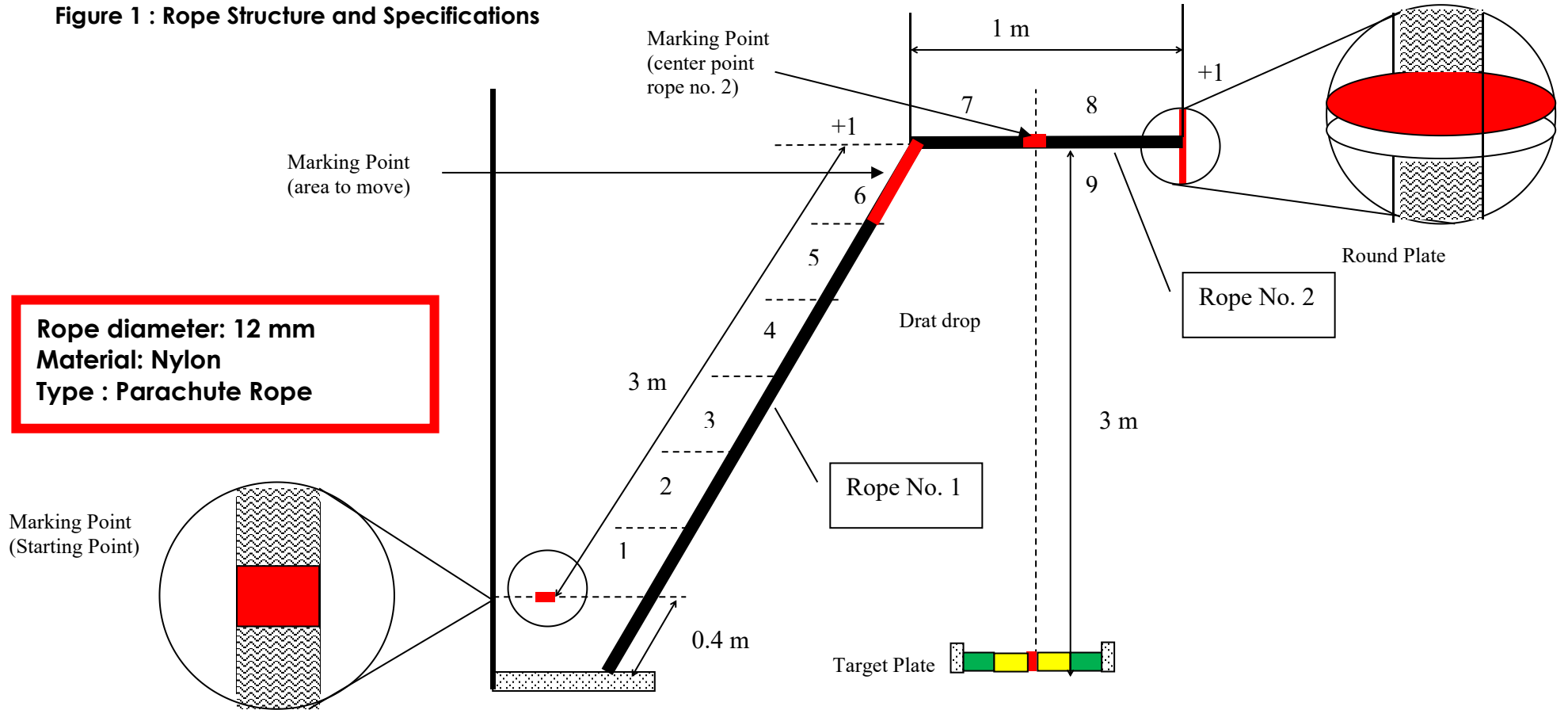
#### The Importance of Safety

Safety is one of the most important elements in the sustainable development of the University Robot Competition: Kingdom of Champions (U-ROCK). The safety of the robots themselves is the first and foremost issue for the safe holding of the contest. The participating teams, as the robot designers, are responsible for the safety of their robots. The teams must work and cooperate closely with the organizers to ensure the utmost safety of the contest. Safety must always be the top priority and it must be considered for all people involved in the contest as officials, participants or spectators in all circumstances. Teams are required to pay sufficient attention to the safety of their robots on this basis before applying to take part in the contest.

## 1.0 Outline of the Contest

*Rope Climbing Robot* is a game based on an imaginary of the military physical training. The *Rope Climbing Robot* will carry a **dart** and climbs up to 3 meters of rope no. 1 (**a dart placed on the robot manually before start a game**). After reached the distant, a robot must grab to rope no. 2 on the right/left of game field and travel to touch the round plate at the end of rope. After touch the round plate, the robot must return back at the center of rope no. 2 and stop to drop a dart on the target plate. The robot is considered completing the task when the robot successfully drops a dart on the target plate without OFF the target. The target plates have a five (5) part of sections with different colors and carry different marks. The target plate has a red color for center point carry 10 marks, followed by yellow color with 8 marks, blue color with 6 marks, green color with 4 marks and black color with 2 marks (See Figure 5 and Figure 6).

Figure 1 : Rope Structure and Specifications



**Touch Plate Diameter: 305 mm**  
**Thickness: 4 mm**  
**Material: Aluminium Composite.**  
**Aluminium (outside layer) +**  
**Rubber (middle layer)**

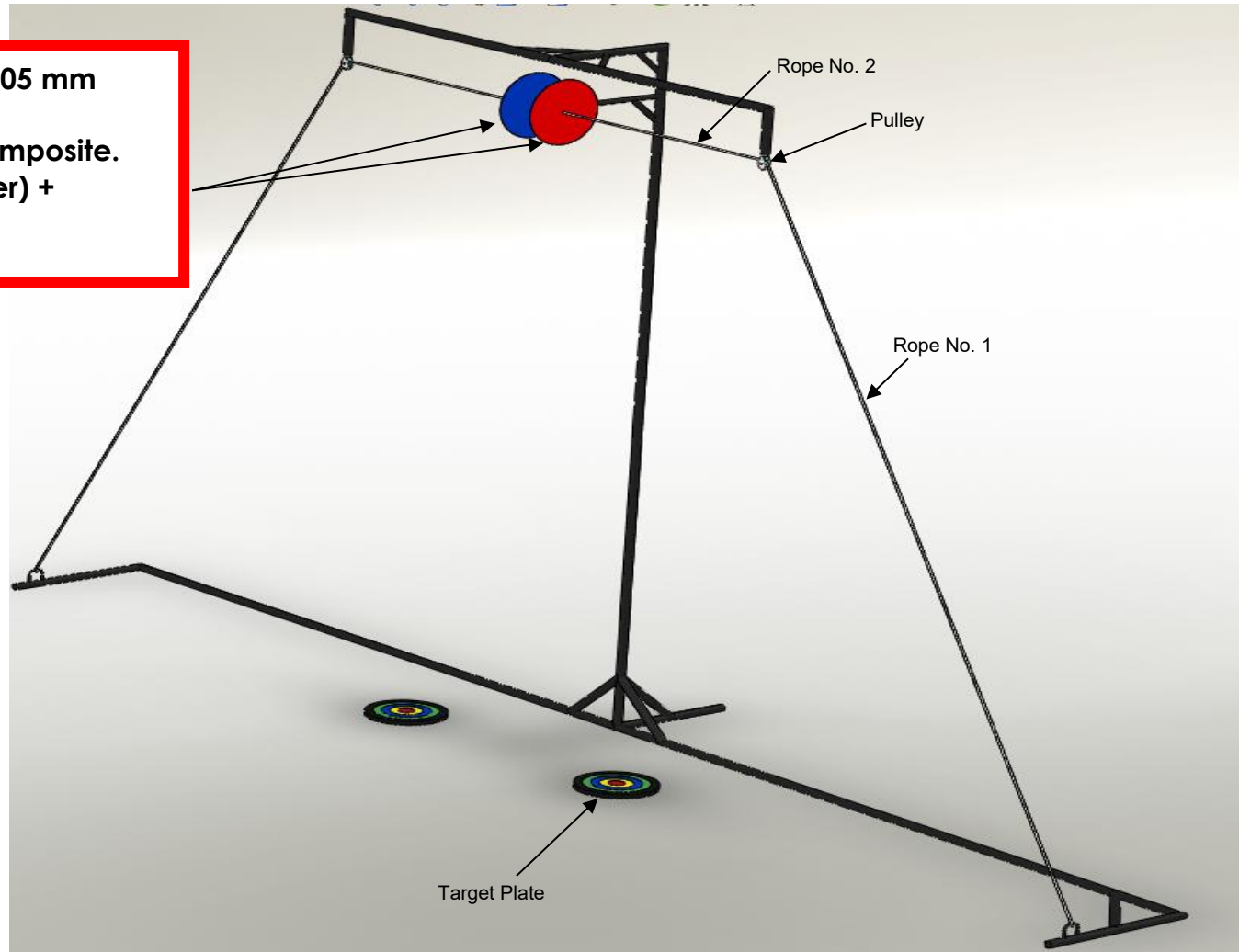


Figure 2: Game Field

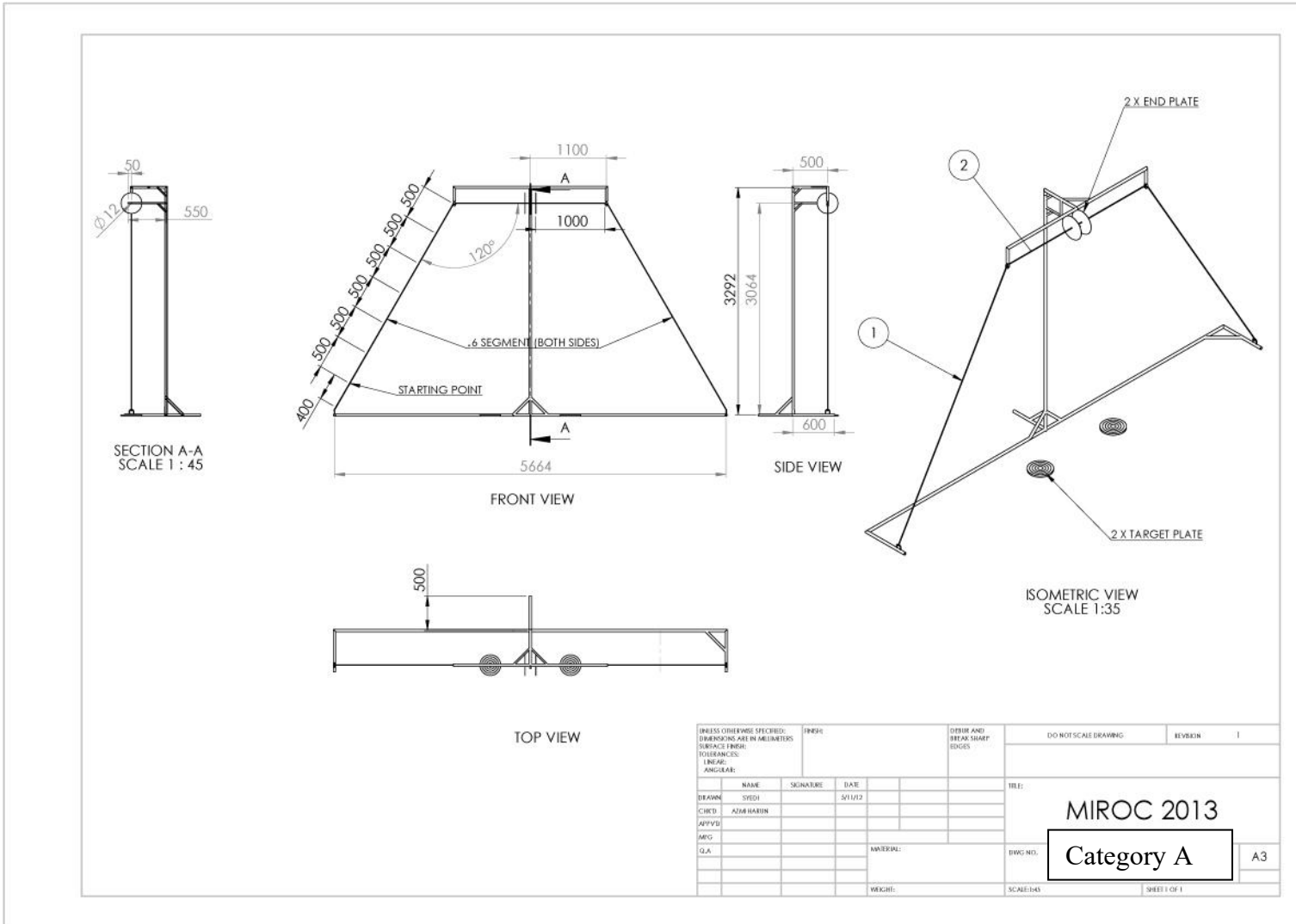


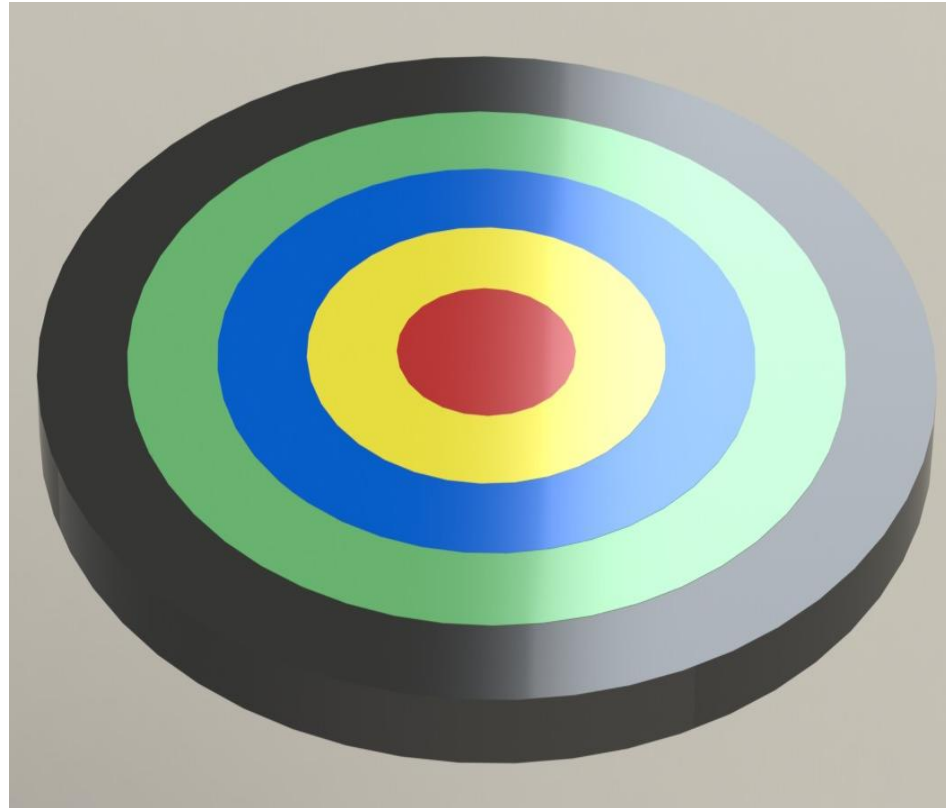
Figure 3: Game Field Technical Drawing (Category A)



Figure 4 : Examples of Dart

**Note:**

1. Weight = **22 grm – 27 grm**
2. Any types and design of dart can be use
3. Any modifications of a dart is **Extremely Banned**
4. **All Team MUST have the own Darts**



**Target Plate Diameter: 300 mm**  
**Thickness: 5 mm**  
**Material: PVC Form.**

**Figure 5: Target Plate**

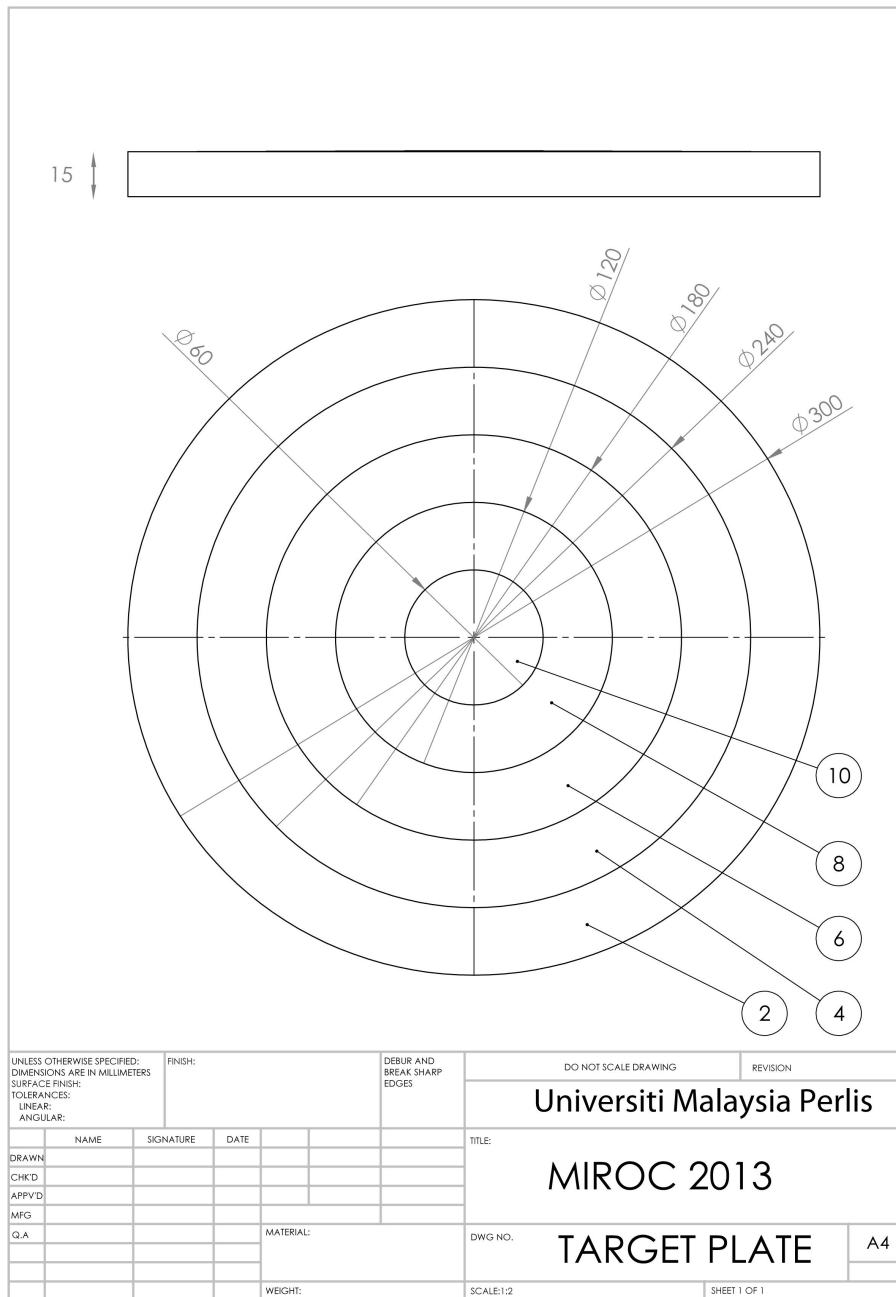


Figure 6: Target Plate Technical Drawing





**Note:**  
The Steel Pulley is welded with Steel Bar on game field structure.

Figure 7: Steel Pulley

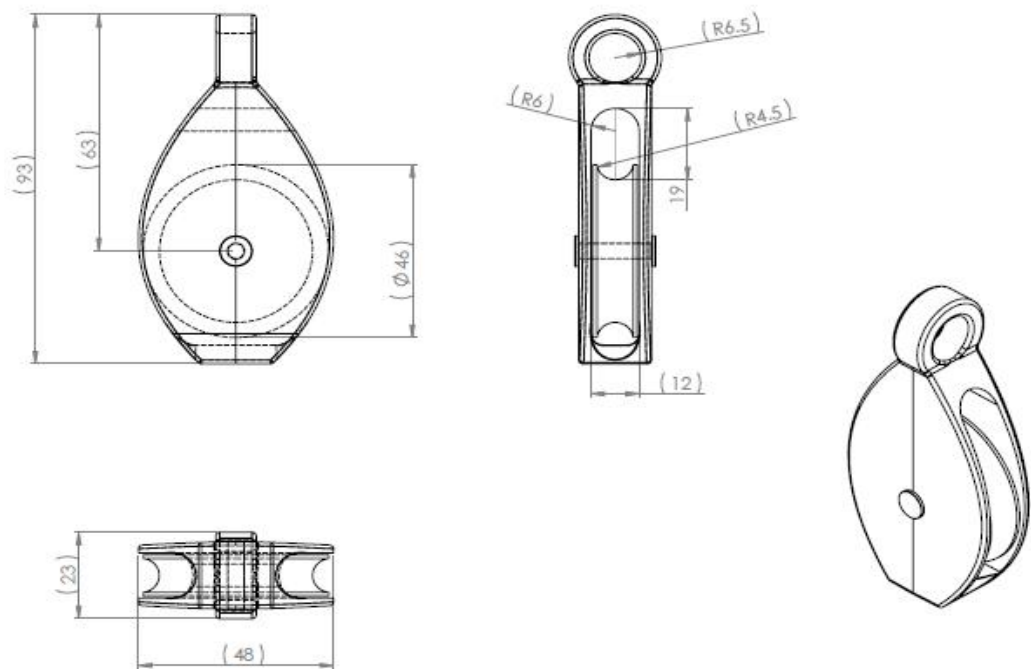


Figure 8: Steel Pulley Technical Drawing (All units in millimeter)

## 2.0 Game Procedure

### 2.1 Length of a match

1. Each match lasts three **(3)** minutes.
2. In the following cases, a match ends even before the passage of 3 minutes.
  - a. When a robot completing the task.
  - b. In the event of disqualification.
  - c. When the referees judge that continuation of the match is impossible.

### 2.2 Setting of robot

1. Only one (1) robot is allowed to enter the game field. However, reserve robots (1 only) are allowed (during the setup time) if the main robots cannot work before the game started.
2. One (1) minute is provided for setting of robot before the start of each match.
3. Two (2) members of each team may engage in setting of robot.
4. Any team that fails to complete setting of robots in one (1) minute shall be able to resume the setting work once the match has begun.

### 2.3 Deployment of the robot and team members at the start of the match

1. The *Rope Climbing Robot* shall be placed in the *Starting Point*. The robot must not over than red tape (Figure 1).
2. Team member responsible for starting the *Rope Climbing Robot* shall wait near their respective robot. They are allowed to start inside the *Game Area*.

### 2.4 Starting the *Rope Climbing Robot*

1. A team member shall start the *Rope Climbing Robot* by single switch operation.
2. After switching the robot ON, the team member who performs the starting operation shall immediately leave the *Rope*.

### 2.5 Competition Tasks

Once the match has begun, each team shall complete the tasks in the following order:

1. The tasks of robot carry a dart and climb the rope (The *tasks of carry and climb*). **(a dart placed on the robot manually before start a game)**
2. The tasks of robot grab and move on to right/left side (The *task of grab and move*).
3. The tasks of robot travel and touch round plate (the task of travel and touch).

4. The tasks of robot return back to the center of rope no. 2 (the task of return back).
5. The tasks of robot stop and drop a dart perfectly fix on a target plate without OFF the target plate (The task of stop and drop).

*The task of stop and drop a dart*

1. The robot shall stop and drop a dart on the target plate at centre of rope no. 2 (Figure 1).

*The task of dropping a dart on target*

1. The dart must be drop perfectly fix on a target plate without OFF the target plate.
2. The dart must be drop within the five (5) parts of section with different colors and carry different marks. The target plate has a red color for center point carry 10 marks, followed by yellow color with 8 marks, blue color with 6 marks, green color with 6 marks and black color with 2 marks. (Figure 5 and Figure 6)

## **2.6 Retries for Robots**

1. In the case of a violation, the referees shall instruct the team to start again (*Retry*).
2. In the case of faulty robot movements, it is possible to start again (*Retry*) with the referees' permission.
3. The robot faulty carry a dart when climb the rope, the robot must be start again (*Retry*) at a starting point with the referees' order.
4. The robot faulty touch the end plate but the robot return back to the rope center point, the robot must be start again (*Retry*) at a starting point with the referees' order.
5. The dart not placed perfectly fix on a target plate and bouncing to the outside of target plate, it is possible to start again (*Retry*) at a starting point with the referees' permission.
6. Team members are permitted to touch the robots while preparing for a *Retry*.
7. *Retry* shall be made from the *Start Point*.
8. At the time of the *Retry*, team members shall switch the robot on to start it. After switching the robot on, the team member who performs the starting operation shall immediately leave the *Rope*.
9. Only a single switch operation is permitted for each robot.
10. *Retries* can be made as many times as necessary.
11. Strategies premised on the use of *Retries* are banned.

## **2.7 Deciding the Winner**

1. The team who's *Rope Climbing Robot* has completed climb the rope, move and travel on rope no. 2, touch the round plate, return back,

stop at the middle of rope no. 2 and drop a dart onto the target plate in three minutes will be a winner. This ends the match.

2. If neither team has achieved the *climb, and drop a dart onto target plate* at the end of the 3-minute match, the winner shall be decided in the following order of priority:
  - a. The team whose have the higher points is the winner.
  - b. If the points are the same, the team who's their robot has the shortest distance from the middle of rope no. 2 will be a winner.
3. Points. See Figure 1
  - a. The *tasks of carry and climb*. (1 to 6 points)
  - b. The *task of grab and move*. (+1 points)
  - c. The task of travel on rope no. 2. (7 to 8 points)
  - d. The *task of touch (end plate)*. (+1 point)
  - e. The task of return back to the middle of rope no. 2. (9 points)
  - f. The task of stop and drop a dart.
  - g. The task of contact a target. (10 points for red target, 8 points for yellow target, 6 points for blue, 4 points green and 2 points for black target) (Figure 5 and Figure 6)
4. If the winner has not been settled by any of the above, the match shall be replayed or the winner shall be chosen by the judges.

### 3.0 Conditions and Points to Watch out for in Designing and Manufacturing Robots

1. Each team shall use only ONE (1) robot.
2. The robots may not divide into sub-units (all components must be integrated in one robot).
3. No communication between the robot and operator.
4. The robot used in the contest must be handmade by students of the university to which the team belongs.
5. Each robot MUST use AT LEAST ONE Microchip PIC® MCU product, as the company is our Exclusive Technology Partner for this event. The construct of the robot should be design to enable easy inspection for the mentioned product at anytime.

#### 3.1 The Rope Climbing Robot

1. The *Rope Climbing Robot* shall move automatically once it has been started by a team member.
2. The *Rope Climbing Robot* shall be started by a single switch operation.
3. The dimensions of the *Rope Climbing Robot* shall **not exceed 300 mm (long) x 300 mm (wide) x 300 mm (tall)**. The robot cannot be expanded more than this dimension.
4. The application of roller, wheel or pneumatic and hydraulic systems as a based mechanism to climb the rope is **EXTREMELY** banned.
5. The robot must be powered not greater than 24 Volt.
6. The weight of the robot must not exceed 3kg.

### 3.2 Detailed rules on safety

1. The use of explosives, fire and dangerous chemicals is prohibited.
2. If a laser is used, it shall be of Class 2 or less. In designing and preparing the laser, full care must be taken to protect all persons at the venue from harm during all procedures. In particular, the beams must be so oriented that they cannot shine into the eyes of the spectators.

### 3.3 Examination of the robots

1. Participating robots shall be examined prior to the test run on the day before the contest and again on the day of the contest before it begins. A team that fails an examination shall not be allowed to participate in the test run or contest.
2. Details of what will be examined will be provided at a later date.

## 4.0 Violations

1. If a violation occurs, a *Retry* shall be made by bringing the robot back to the *Start*. The place and method of the *Retry* is laid down in "Retries for Robots". First violation (Yellow card) 5 marks will be deducted from the final points. Second violations (Red card) are directly disqualified from the game and no point given (0 point). The following cases are violations:
  - a. Any part of either robot or its operator enters onto the opposing team area or into the space above it.
  - b. The any parts of the robot touch any part of the game field except the rope.
2. Other actions that infringe on the rules without producing disqualification.

## 5.0 Disqualification

A team shall be disqualified if it commits any of the following during the match:

1. The team damages or tries to damage the *Rope* and/or facilities and equipment or opponent's robots.
2. The team's robot that has entered onto the opposing team *Rope* or into the space above it comes in contact with an opposing robot.
3. The team performs any act that is not in the spirit of fair play.
4. The team fails to obey instructions and/or warnings issued by the referees.
5. The teams who are fail to attend in Five (5) minutes into the field when called by referee.

## 6.0 On the Safety of the Robots

1. All robots shall be so designed and manufactured as to pose no danger of any kind to any person in the venue.
2. All robots shall be so designed and manufactured as to cause no damage to any robot of an opposing team or the *Rope*.

## 7.0 Teams

1. Each participating university in the contest can be represented by **ONE (1) team only**. UniMAP, as Host University, may be represented by two teams.
2. A team consists of two students and one instructor who all belong to the same university. The two students of the team are entitled to participate in the match itself.
3. In addition, a one-member pit crew can adjust the robots in the pit room and help to carry the robots to the *Rope*, but cannot participate in the match itself. The members of the pit crew must be students of the same university as the team.
4. The organizer defines the term of 'student' is undergraduate and postgraduate student.

## 8.0 Others

1. The legitimacy of any action not provided for in this rule book shall be subject to discretion of the referees.
2. The dimensions, weights etc. of the *Rope* and other facilities and equipment described in this rule book have a margin of error of plus or minus 5% unless otherwise stated.
3. All questions should be addressed to the official website of University Robot Competition: Kingdom of Champions ([urock.unimap.edu.my](http://urock.unimap.edu.my)). A Q&A section will be provided on the Game briefing and on site during site visit.
4. Notification of any addition and/or correction to this rule book shall be made on the official web site.
5. The referees may demand additional explanations on safety issues when the safety of a robot is deemed to be in question.