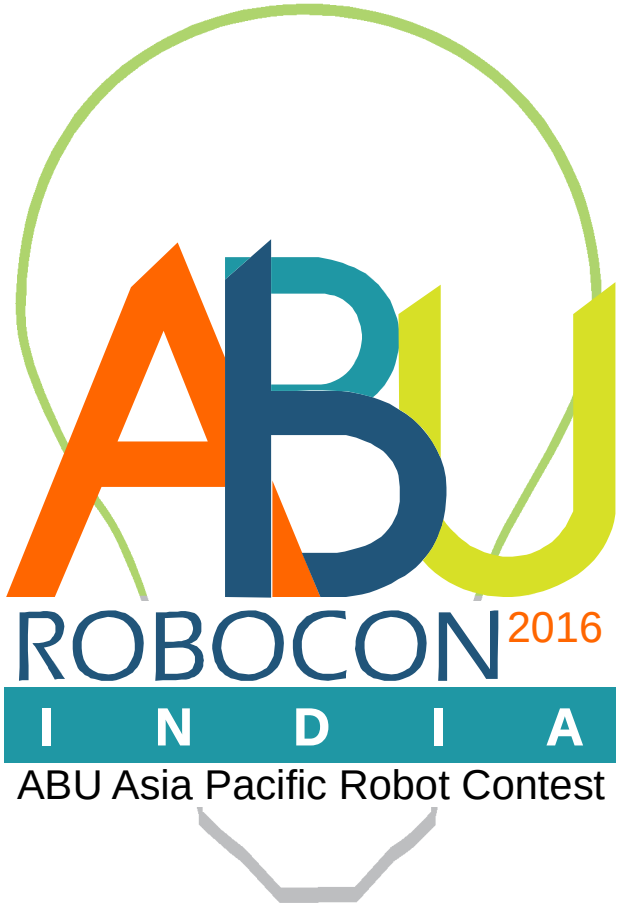
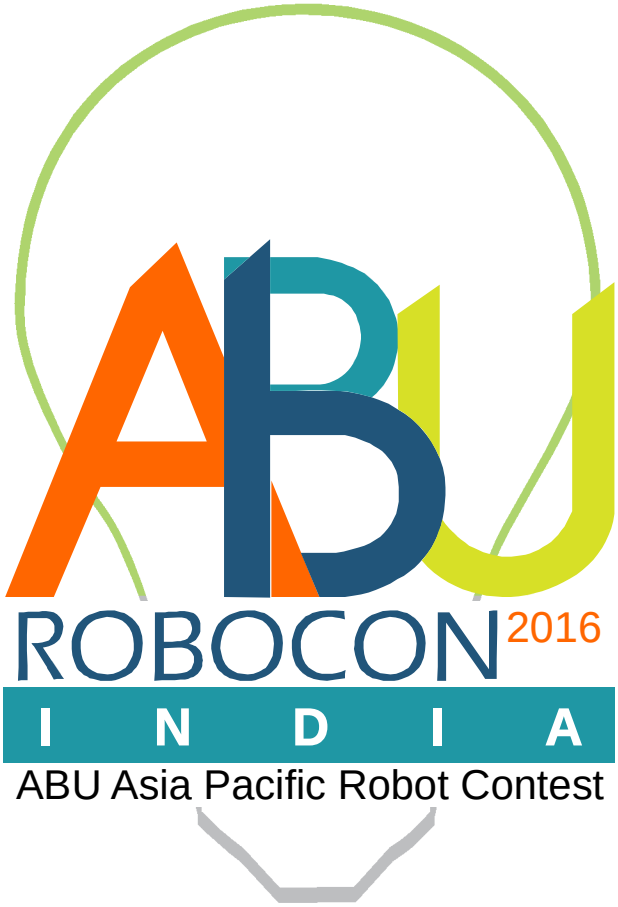
ROBOCON
National Robotic Contest 2016



THEME & RULES
“Clean Energy Recharging the World”

www.roboconindia.com


ABU
ROBOCON 2016
INDIA
ABU Asia Pacific Robot Contest

Quick Guide

The Contest Theme:

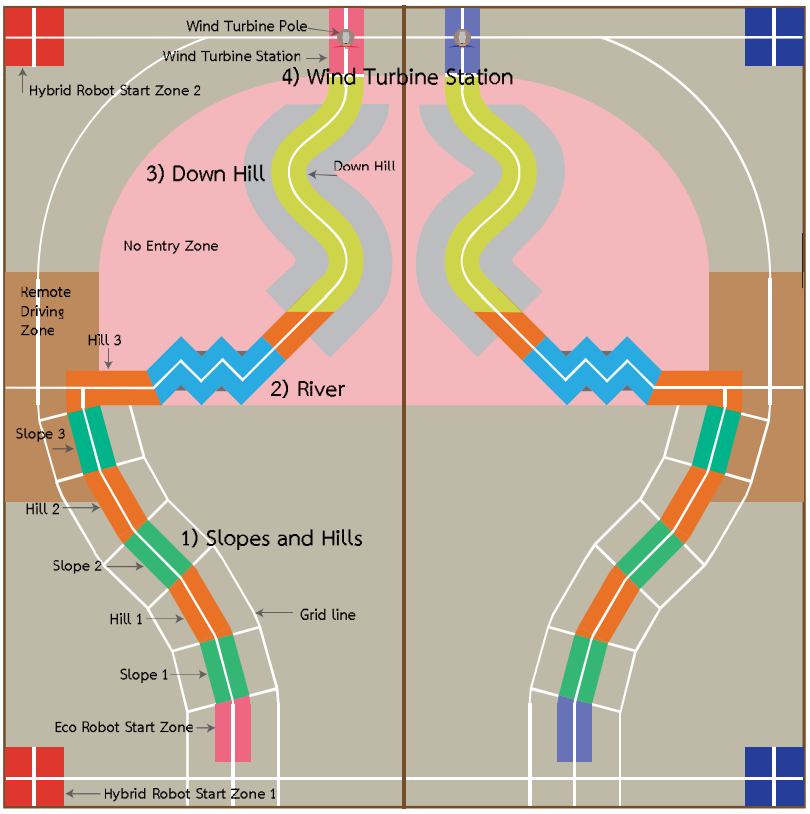
"Clean Energy Recharging the World"

Outline of the contest:

A match is contested by Red and Blue teams. It lasts 3 minutes at most.
Each team consists of two robots: **one Eco Robot** and **one Hybrid Robot**. Eco Robot doesn't have an actuator to drive itself. The driving force of Eco Robot is obtained indirectly from Hybrid Robot; for example, wind force, magnetic force, etc., or from the game field structure, gravity force, etc.

Eco Robot carrying Wind Turbine Propeller departs from "Eco Robot Start Zone". It runs along 3 zones; "3 Slopes and Hills" "River" "Down Hill", and aims for "Wind Turbine Station" by receiving driving energy from Hybrid Robot.

After Eco Robot reaches at "Wind Turbine Station", Hybrid Robot gets Wind Turbine Propeller from Eco Robot. Then Hybrid Robot climbs Wind Turbine Pole and assembles Wind Turbine Propeller on Wind Turbine Engine attached on top of Wind Turbine Pole. The team that successfully assembles Wind Turbine Propeller earlier is the winner of the game. This type of winning is called "Chai-Yo".



Contents

THE CONTEST THEME

“Clean Energy Recharging the World”

Game Concepts

At present, we utilize energies for several purposes in daily lives. The sources of all energies are from nature. Human extract or synthesize these energies from nature. Among all the energies, fossil energy is among the cheapest and easily available. In the past, we misunderstood that fossil energy had unlimited amount and superfluously consumed them. Our energy-consuming habit from the past has affected us a lot this day. The sources of fossil energy are harder to explore. The existing fossil energy will last not too long. In order to solve this problem, we have to efficiently utilize the existing energy and at the same time explore and utilize alternative sustainable energy which should be clean and renewable in order to compensate the energy from fossil.

Based on the reasons above, the game of ABU Robocon 2016 is designed in order to create the awareness of efficient energy consumption and clean and renewable energy utilization. Each team has to build two robots; Eco Robot and Hybrid Robot. Eco Robot doesn’t have an actuator to drive. It receives the driving energy from Hybrid Robot. Eco Robot has to use only one steering actuator to control its direction, to track the path containing Slopes and Hills, River, and Down Hill. Besides providing driving energy to Eco Robot, Hybrid Robot has to take Wind Turbine Propeller from Eco Robot and climb up Wind Turbine Pole in order to assemble Wind Turbine.

Ideas

Main ideas in designing the rules:

1. The team utilizes limited resources to design robots’ mechanisms and strategies to accomplish the assigned tasks.
2. The automatic control technique is emphasized in this game.
3. The game is challenging for the contestants.
4. The game is easy to understand and entertains the spectators.
5. The winner of each game is not predictable until the end of the game.

The importance of Safety

Safety is one of the most important elements in the sustainable development of the ABU Robocon.

The safety of the designed robots is the first and foremost issue for the safety principle 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 by all people involved in the contest including officials, participants and spectators in all circumstances.

Teams are required to pay sufficient attention to the safety of their robots before applying to take part in the contest.

Team members must wear running shoes with rubber sole, helmets, and safety goggles during the matches and test runs.

Domestic Contests in Each Country and/or Region

All domestic contests in each country and/or region organized to find the representatives to participate in ABU Robocon 2016 Bangkok should conform to the rules. It is understood, however, that materials may not be available in some places. Domestic organizers are advised to use the best possible materials and adhere as closely as possible to the specifications laid down for the final contest.

Rules

Terms and Definitions

Terms and definitions which are used in the rules of ABU Robocon 2016 Bangkok are given here.

Term	Definition
Eco Robot	An automatic robot. It doesn't have an actuator to drive itself. It receives driving energy from Hybrid Robot. Also It has to use only a steering actuator to control its direction to track the path.
Hybrid Robot	Hybrid Robot: Either a semi-autonomous or fully autonomous robot. It indirectly drives Eco Robot; for example, using wind force, magnetic force, etc.
Actuator	A device that creates motion; for examples, motor, pneumatic piston, hydraulic piston, solenoid
Steering	An action that turns heading direction of a robot
Driving	An action that creates front motion of a robot
Semi-autonomous	Ability to work independently for some actions and also work according to commands from an operator
Fully autonomous	Ability to work independently without any helps from an operator

1. Game Procedure and Competition Tasks

Once the game has begun, each team has to complete the tasks in the following sequences:

1.1 Setting of robots

1.1.1 One minute is given for setting of the robots before the game starts.

1.1.2 At most, three team members of each team can engage in setting of the robots. Pit crew cannot join setting.

1.1.3 Any teams that fail to complete setting of the robots within one minute can resume the setting again once the game starts.

1.2 Deployment of the robots and team members at the start of the game

1.2.1 Hybrid Robot must be started in Hybrid Robot Start Zone 1.

1.2.2 Eco Robot must be started in Eco Robot Start Zone. Wind Turbine Propeller must be placed on Eco Robot. It can be placed anywhere on Eco Robot's body.

1.3 Slopes and Hills

1.3.1 3 Slopes and Hills

Hybrid Robot starts from Hybrid Robot Start Zone 1. Eco Robot carrying Wind Turbine Propeller stands-by in Eco Robot Start Zone. Hybrid Robot must indirectly drive Eco Robot; for example, using wind force, magnetic force, etc. The remote driven Eco Robot travels 3 Slopes and Hills.

1.3.2 Hybrid Robot is allowed to extend its arm over Slopes and Hills in order to move close to Eco Robot during Slopes and Hills but cannot physically touch Eco Robot, Slopes and Hills.

1.4 River

Hybrid Robot must indirectly drive Eco Robot from Remote Driving Zone. The remote driven Eco Robot, carrying Wind Turbine Propeller must cruise along the zig zag River and completely enter Highland.

1.5 Down Hill

Eco Robot uses gravitational force to drive itself in Down Hill. Hybrid Robot is allowed to decelerate or control the motion of Eco Robot from outside No Entry Zone. Eco Robot carrying Wind Turbine Propeller slides along Down Hill from Highland and enters Wind Turbine Station completely.

1.6 At the Wind Turbine Station, Hybrid Robot takes Wind Turbine Propeller completely out from Eco Robot.

1.7 Hybrid Robot in autonomous mode climbs Wind Turbine Pole in order to assemble Wind Turbine Propeller.

1.7.1 If Hybrid Robot is a fully autonomous robot from the beginning, Hybrid Robot is allowed to continuously climb Wind Turbine Pole immediately.

1.7.2 If Hybrid Robot is controlled by an operator in the previous task(s), Hybrid Robot has to move to Hybrid Robot Start Zone 2 after taking Wind Turbine Propeller completely out from Eco Robot.

1.7.2.1 With permission from the referee, Hybrid Robot in manual mode must be transformed to autonomous mode. The transformation must be conducted in Hybrid Start Zone 2. Team members can enter the contest field and touch Hybrid Robot during transformation.

1.7.2.3 Once Hybrid Robot in manual mode is transformed to autonomous mode, it cannot be reverted back to manual mode again throughout that game.

1.8 Hybrid Robot carrying Wind Turbine Propeller climbs Wind Turbine Pole and assembles Wind Turbine Propeller on Wind Turbine Engine attached on top of Wind Turbine Pole.

1.9 The team that successfully assembles Wind Turbine Propeller earlier is the winner of the game. This type of winning is called “Chai-Yo”.

1.10 Team members are not allowed to touch any robots except during starting operation, Hybrid Robot’s transformation, or retry.

2. Retries of Robots

2.1 A retry can be made only after the referee permission.

2.2 Team members are allowed to touch the robots while preparing for a retry.

2.3 Retries of Eco Robot or Hybrid Robot or both robots at the same time can be made as many times as necessary.

2.4 A retry is compulsory if Eco Robot falls out of the traveling path or
Wind Turbine Propeller falls out of Eco Robot or Eco Robot conducts any violations.

2.5 Restart position after a retry of Eco Robot is assigned as follows:

Last Position of Eco Robot before Retry	**Restart Position of Eco Robot**
Eco Robot does not enter Hill 1.	Eco Robot Start Zone
Eco Robot has passed Hill 1 but does not enter Hill 2 completely.	Hill 1
Eco Robot has passed Hill 2 but does not enter Hill 3 completely.	Hill 2
Eco Robot has passed Hill 3 but does not enter Highland completely.	Hill 3
Eco Robot has passed Highland but does not enter Wind Turbine Station completely.	Highland
Eco Robot has entered Wind Turbine Station but Hybrid Robot does not successfully take Wind Turbine Propeller out from Eco Robot completely.	Both robots start at their last positions where they fail the task.

The team is allowed to restart Eco Robot at any restart positions locating before the assigned restart position.

2.6 A retry is compulsory if Hybrid Robot conducts any violations.

2.7 Restart position after a retry of Hybrid Robot is assigned as follows:

2.7.1 A retry of Hybrid Robot before transformation to autonomous mode is made at Hybrid Robot Start Zone 1 only.

2.7.2 If a retry occurs when Hybrid Robot has already transformed to become autonomous robot but does not touch Wind Turbine Pole yet, Hybrid Robot restarts the retry at Hybrid Robot Start Zone 2.

2.7.3 If a retry occurs when Hybrid Robot has already started climbing Wind Turbine Pole but does not assemble Wind Turbine Propeller successfully yet, Hybrid Robot restarts the retry by re-climbing Wind Turbine Pole again.

2.7.4 If only Hybrid Robot asks for a retry not both robots, only Hybrid Robot comes back to Hybrid Robot Start Zone 1. Eco Robot still stays at the last position.

2.8 Strategies premised on the use of retries are allowed.

3. Deciding the Winner

3.1 The first team that Hybrid Robot successfully climbs Wind Turbine Pole and assembles Wind Turbine Propeller is the winner of the game by knock-out. This type of winning is called “Chai-Yo”.

3.2 If neither team achieves “Chai-Yo” at the end of the 3 minutes match, the winner is decided based on the earning scores. The team that earns higher score after score deduction from violation is the winner. The score of each task is described as follows:

Zone where Eco Robot has completely entered	Score
Hill 1	10 points
Hill 2	10 points
Hill 3	10 points
Highland	10 points
Wind Turbine Station	10 points
Hybrid Robot successfully takes Wind Turbine Propeller completely out from Eco Robot.	10 points

* Points are given only once per each task.

3.3 The game result

3.3.1 The game result is announced after the end of the 3 minutes match and the referee already checks and confirms the completed tasks and the faulty actions of the robots.

3.3.2 The match will end when

3.3.2.1 End of 3 minutes.

3.3.2.2 One of the teams is disqualified.

3.3.2.3 One of the teams achieves “Chai-Yo”.

3.3.3 A total score of 100 points is given to the team that achieves “Chai-Yo” during group stage.

3.4 In case of a draw, the winner is decided based on the following order.

3.4.1 The team that gets the last earning score earlier.

3.4.2 The team that total weight of the robots is lighter.

3.4.3 The team that is selected by the referee as the winner of that match.

4. Robots Design and Development

4.1 Regulations for both Eco Robot and Hybrid Robot

4.1.1 Each team has to build 2 robots: one Hybrid Robot and one Eco Robot.

4.1.2 Each robot cannot be split into sub-units or connected by flexible cords.

4.1.3 Communication between robots is not allowed.

4.1.4 The robots in the contest must be built by the team members from the same university/college/polytechnic.

4.1.5 Weights of the robots

The total weight of Hybrid Robot, Eco Robot, controller, cable, primary set of batteries and any equipment or devices used in the entire contest must not exceed 40 kg. However, the back-up set of batteries of the same type, weight and voltage as the primary set of batteries, is exempted.

4.1.6 Power sources of the robots

4.1.6.1 Each team must prepare its own power sources.

4.1.6.2 The voltage of the power sources used by each robot must not exceed DC 24V.

4.1.6.3 The pressure of the compressed air power must be not more than 6 bars.

4.1.6.4 The organizer has the right to declare and prohibit any dangerous and inappropriate power sources.

4.2 Eco Robot

4.2.1 Eco Robot must have its dimension no less than 400 mm in width, length and height all the time. There is no limitation on the maximum dimension of Eco Robot. (Refer also to Appendix 3.2 on Robot Box)

4.2.2 Eco Robot is allowed to use only one actuator to steer heading direction of the robot. The actuator is not allowed to drive the robot. The driving force of Eco Robot is obtained indirectly from Hybrid Robot; for example, wind force, magnetic force, etc., or from the game field structure; for example, gravity force, etc.

4.3 Hybrid Robot

Hybrid Robot can be either semi-autonomous or fully autonomous robot.

4.3.1 Hybrid Robot must have its dimension no larger than 1,000 mm in width, length and height all the time. (Refer also to Appendix 3.2 on Robot Box)

4.3.2 The robot is allowed to expand, stretch or extend as long as the dimension is still within the limit dimension.

4.3.3 Hybrid Robot cannot physically touch Eco Robot except during taking Wind Turbine Propeller from Eco Robot at Wind Turbine Station.

4.3.4 Semi-autonomous Hybrid Robot operation

4.3.4.1 An operator is allowed to operate the robot for all tasks except Wind Turbine assembly task.

4.3.4.2 The operator can be inside the game field for all tasks except during Wind Turbine assembly task that no one is allowed to stay in the game field.

4.3.4.3 Hybrid Robot is operated by the operator through a connected cable. The length of cable from Hybrid Robot to the controller must be in between 1,000 mm and 3,000 mm.

4.3.4.4 An infrared, visible ray, sonar, sound, or wireless radio frequency remote control is prohibited. The operator is not allowed to ride on the robot.

4.3.4.5 Semi-autonomous Hybrid Robot has to transform to autonomous mode before climbing Wind Turbine Pole only inside Hybrid Robot Start Zone 2. It is not allowed to remove any parts out of Hybrid Robot during the transformation.

4.3.5 Fully autonomous Hybrid Robot operation

4.3.5.1 If Hybrid Robot is designed as a fully autonomous robot, all team members must be outside the game field except during start operation or a retry.

4.4 Examination of the robots

4.4.1 Participating robots are examined prior to the test run on the day before the contest and again on the day of the contest before it begins. The team that fails the examination is not allowed to participate in the test run or contest.

4.4.2 Details of what to be examined and how will be provided at a later date.

5. Violations

If a violation occurs, 5 points will be immediately deducted. A retry is compulsory after each violation. The violations are categorized as follows:

5.1 Any parts of any robots or Wind Turbine Propeller moves out of the game field.

5.2 Any parts of any robots or Wind Turbine Propeller enters the opposing team area or the space above it.

5.3 Any parts of Hybrid Robot touch Eco Robot or Wind Turbine Propeller, except during taking Wind Turbine Propeller from Eco Robot at Wind Turbine Station.

5.4 Any parts of Hybrid Robot touch Slopes, Hills, River, Highland, Down Hill.

5.5 Any parts of Hybrid Robot enter No Entry Zone or the space above it.

5.6 Hybrid Robot stays outside Remote Driving Zone while Eco Robot is traveling in River.

5.7 Hybrid Robot stays inside Remote Driving Zone but any other parts of Hybrid Robot move beyond the polygon area formed by Remote Driving Zone, Slope 3, and Hill 3 while Eco Robot is traveling in River.

5.8 Any team members touch any parts of any robots except controller or cable of Hybrid Robot.

5.9 The team makes a false start. The game (both teams) will be restarted.

5.10 Other actions that infringe on the rules without mentioning in the disqualification are considered as violations.

6. Disqualifications

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

6.1 The team damages or tries to damage the field, facilities, equipment or opponent's robots.

6.2 The team performs any acts that are not in the spirit of fair play.

6.3 The team fails to obey instructions or warnings issued by the referees.

6.4 The team has made false start for three times in the same match.

7. Safety Issues of the Robots

7.1 All robots must be designed and manufactured as to pose no danger of any kinds to any persons in the venue.

7.2 All robots must be designed and manufactured as to cause no damage to any robots of the opposing team or the field.

7.3 Safety rules

7.3.1 The use of explosives, fire or dangerous chemicals is prohibited.

7.3.2 If a laser is used, it must 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.

8. Teams

Two teams (Red and Blue teams) compete in each match.

8.1 Each participating country or region in the contest can be represented by one team only. Thailand, as the host country, may be represented by two teams.

8.2 A team consists of three students, called team members, and one instructor who all belong to the same college, university or polytechnic. The three students of the team are entitled to participate in the match.

8.3 In addition, three members of pit crews are allowed to assist in the pit area and to carry the robots to the field, but cannot participate in the match including setting. The members of the pit crews must be students of the same college, university or polytechnic as the team.

8.4 Participation of post-graduate students is not permitted.

9. Others

9.1 The legitimacy of any actions not provided in this rule book will be subject to discretion of the referees.

9.2 The dimensions, weights, etc., of the field, facilities and equipment described in this rule book have a **margin of error of plus or minus 5%** unless otherwise stated. However the dimensions and weights of the robots as shown in the rule book are the maximum and cannot be tolerated.

9.3 All questions should be addressed to the official website of the ABU Asia-Pacific Robot Contest 2016 Bangkok, http://www.aburobocon2016.com FAQ section will be provided on the site.

9.4 Notification of any additions and/or corrections to this rule book will be made on the official web site.

9.5 The referees may demand additional explanations on safety issues when the safety of a robot is deemed to be in question.

10. Game Field: Structure and Specifications

10.1 The field consists of a Game Area having the dimension of 14,000 mm x 14,000 mm and surrounded by a wooden fence with the height of 100 mm and the thickness of 5 mm. The game field is divided equally for two teams by a wooden fence with the height of 100 mm and the thickness of 5 mm. The competing teams are Red and Blue teams. (Figures 1)

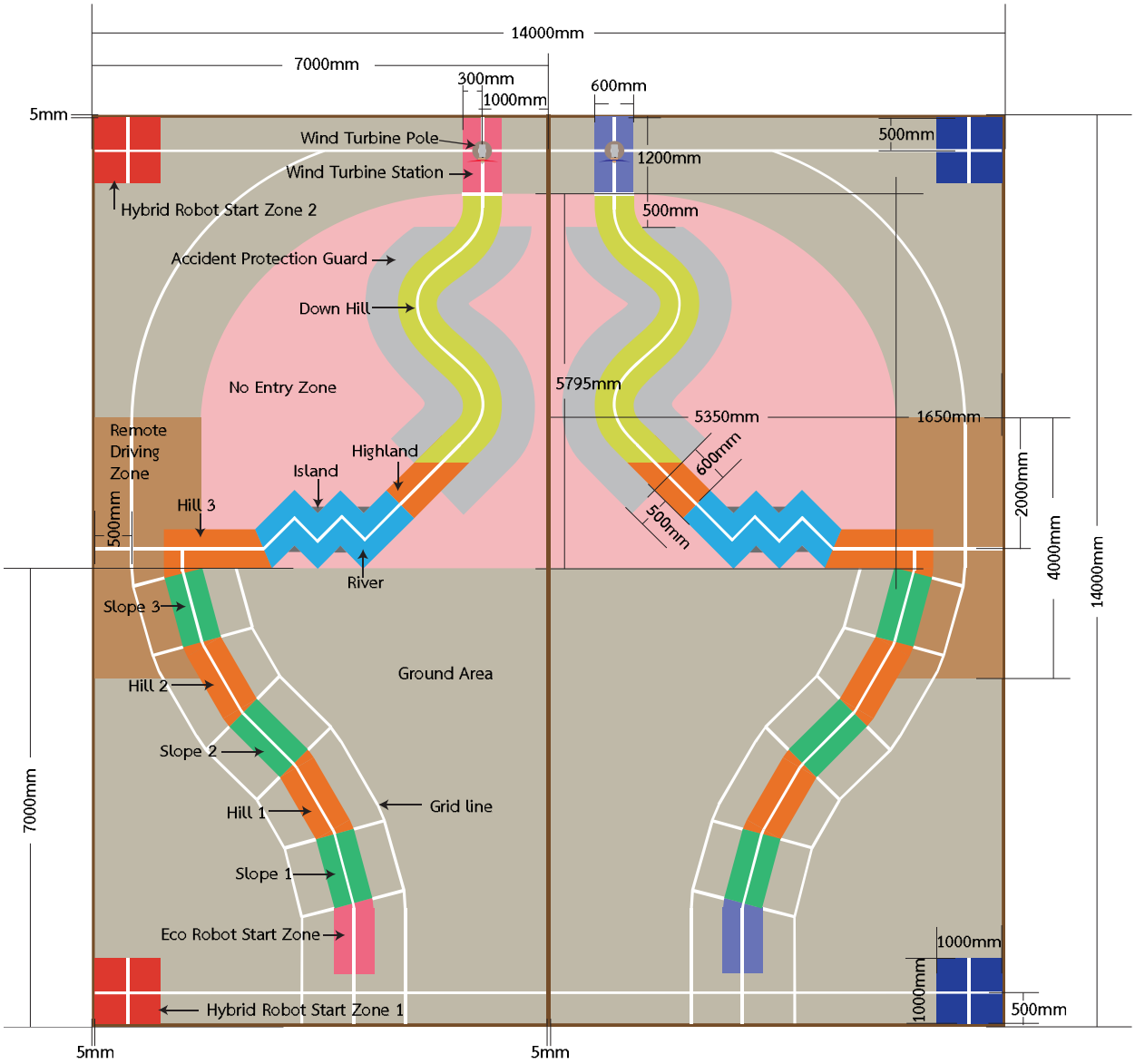


Figure 1: Game Field

10.2 White lines “Grid lines” with the width of 30 mm made of non-shiny sticker are drawn on the floor of the Game Area which can be used to guide the motion of Hybrid Robot and are drawn on the traveling path of Eco Robot which can be used to guide the motion of Eco Robot.

10.3 Game area of each team

10.3.1 “Hybrid Robot Start Zone 1” is a square area with the length of 1,000 mm each side. At the beginning of the game, Hybrid Robot has to stay at Hybrid Robot Start Zone 1.

10.3.2 “Eco Robot Start Zone” is a polygon area with the width of 600 mm. Eco Robot Start Zone of Red team is in pink color. Eco Robot Start Zone of Blue team is in sky-blue color. At the beginning of the game, Eco Robot has to stay at Eco Robot Start Zone.

10.3.3 “3 Slopes and Hills” are parts of Eco Robot’s traveling path having the width of 600 mm. There are 3 sets of Slope and Hill. (Figures 2)

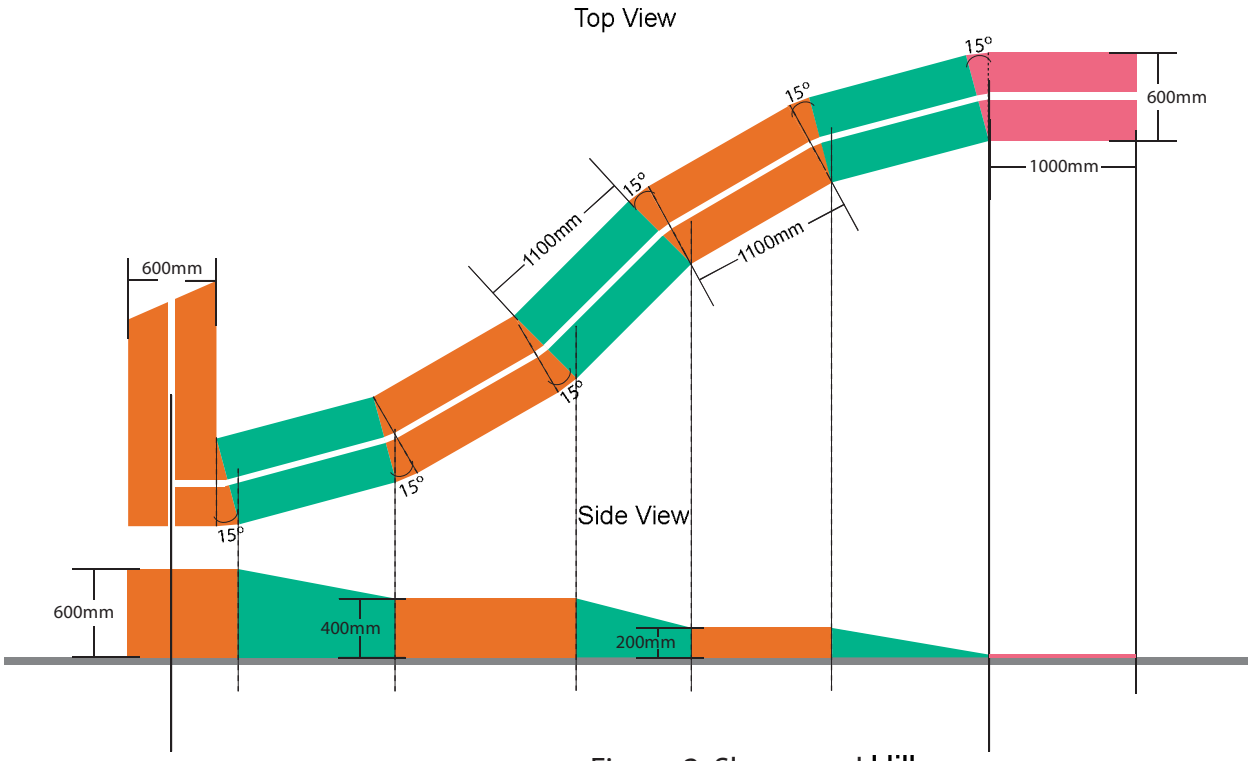


Figure 2: Slopes and Hills

Hill 1 is 200 mm, Hill 2 is 400 mm, and Hill 3 is 600 mm above the floor respectively. Slope 1 connects Eco Robot Start Zone with Hill 1. Slope 2 connects Hill 1 and Hill 2. Slope 3 connects Hill 2 and Hill 3.

10.3.4 "River" is a part of Eco Robot's traveling path having the width of 600 mm. River is zigzag seen from top view.

10.3.4.1 Islands locating at the inner corners near River to obstruct straight motion from Hill 3 to Highland of Eco Robot. Each Island is an isosceles triangular prism with the triangular base of 200 mm, the triangular height of 100 mm. The prism height is up to 100 mm from the surface of River. (Figures 3)

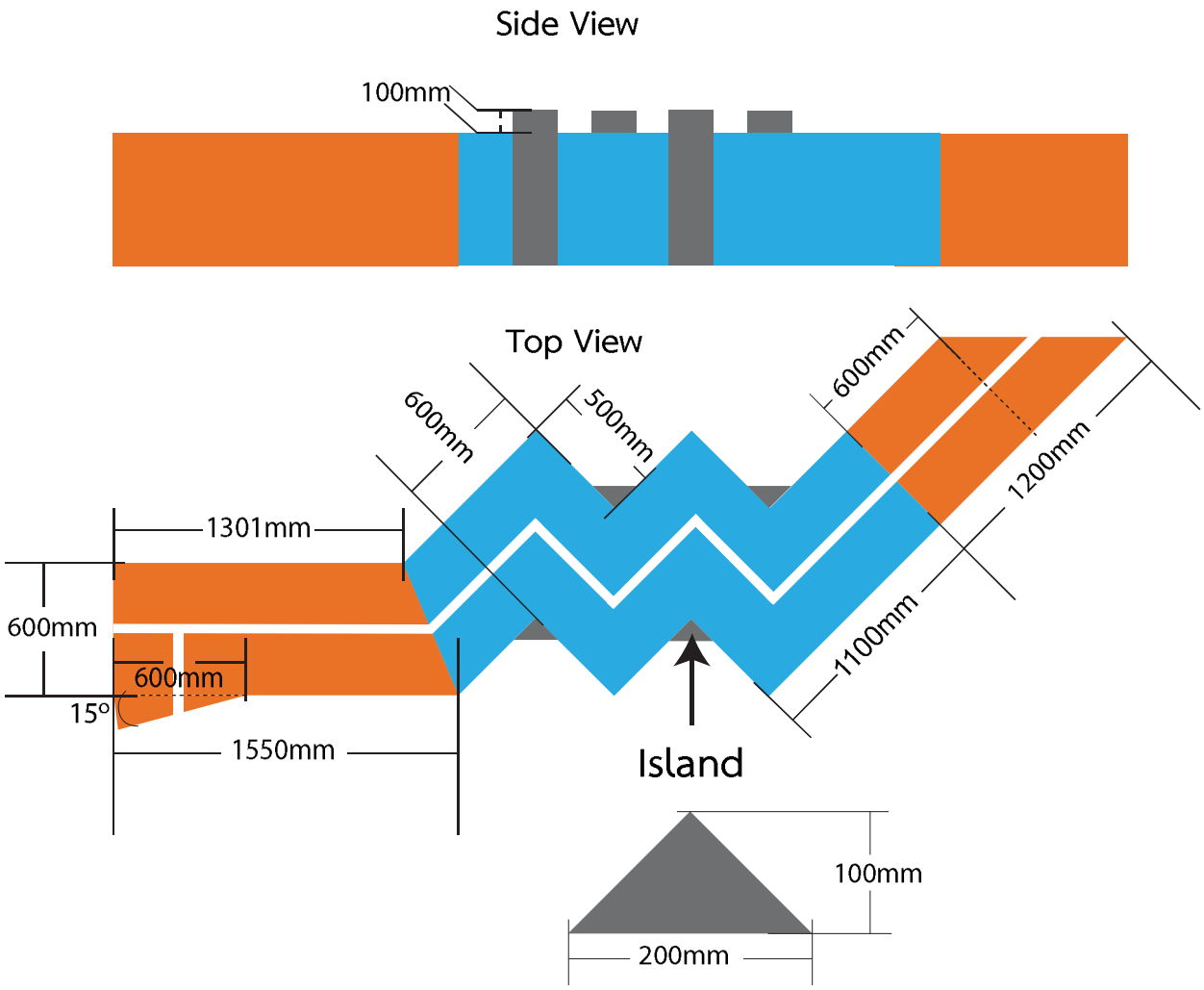


Figure 3: River

10.3.5 "Down Hill" is a part of Eco Robot's traveling path having the width of 600 mm. Down Hill descends from 600 mm above the floor until the floor level. Down Hill is a wave curve seen from top view. (Figures 4)

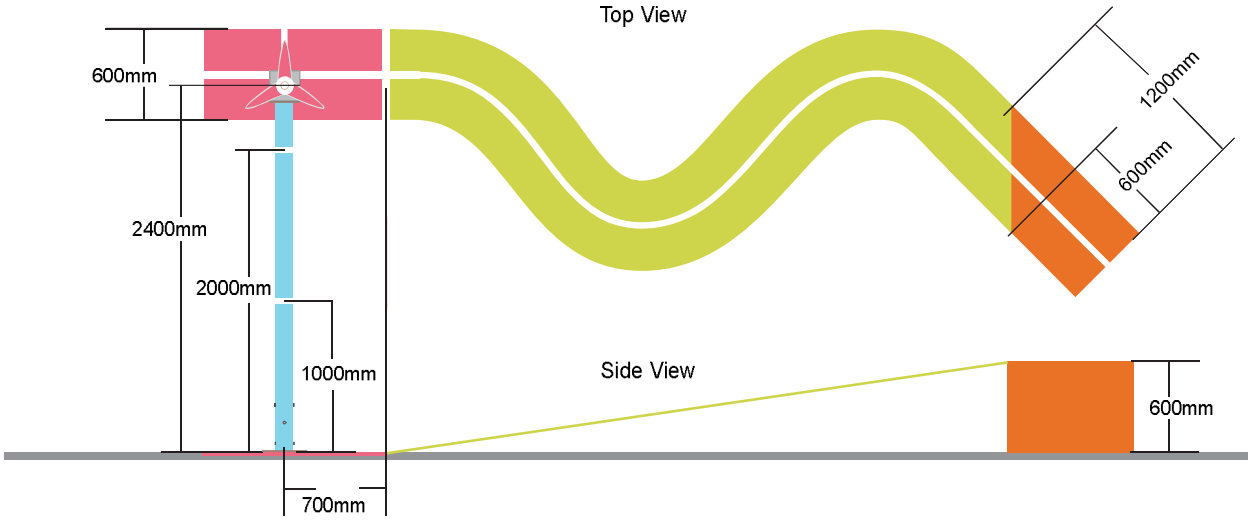


Figure 4: Down Hill

10.3.6 "Wind Turbine Station" is a rectangular area connected with Down Hill. It is the area where Hybrid Robot takes Wind Turbine Propeller out from Eco Robot. Hybrid Robot climbs Wind Turbine Pole locating inside Wind Turbine Station in order to assemble Wind Turbine Propeller.

10.3.7 "Hybrid Robot Start Zone 2" is a square area with the length of 1,000 mm each side. In this area, Hybrid Robot transforms to autonomous mode before climbing up Wind Turbine Pole.

10.3.8 "Ground Area" is an area where Hybrid Robot is allowed to perform any actions which do not violate the rules.

10.3.9 "No Entry Zone" is a quarter of circular area. Hybrid Robot is not allowed to enter or extend any parts of the robot above this area.

10.3.10 "Remote Driving Zone" is a designated area where Hybrid Robot is allowed to remotely drive Eco Robot on the zigzag River. Hybrid Robot is not allowed to exit this area as long as Eco Robot is still in River. However, Hybrid Robot is allowed to extend its arm over Slope 3 and Hill 3 during remote driving.

10.4 Accident Protection Guards (Sponge) are installed at the left and right sides along Down Hill to protect the damage of Eco Robot that falls from Down Hill.

11. Wind Turbine and Tools Specifications

Wind Turbine consists of Wind Turbine Pole, Wind Turbine Engine, and Wind Turbine Propeller. (Figures 5)

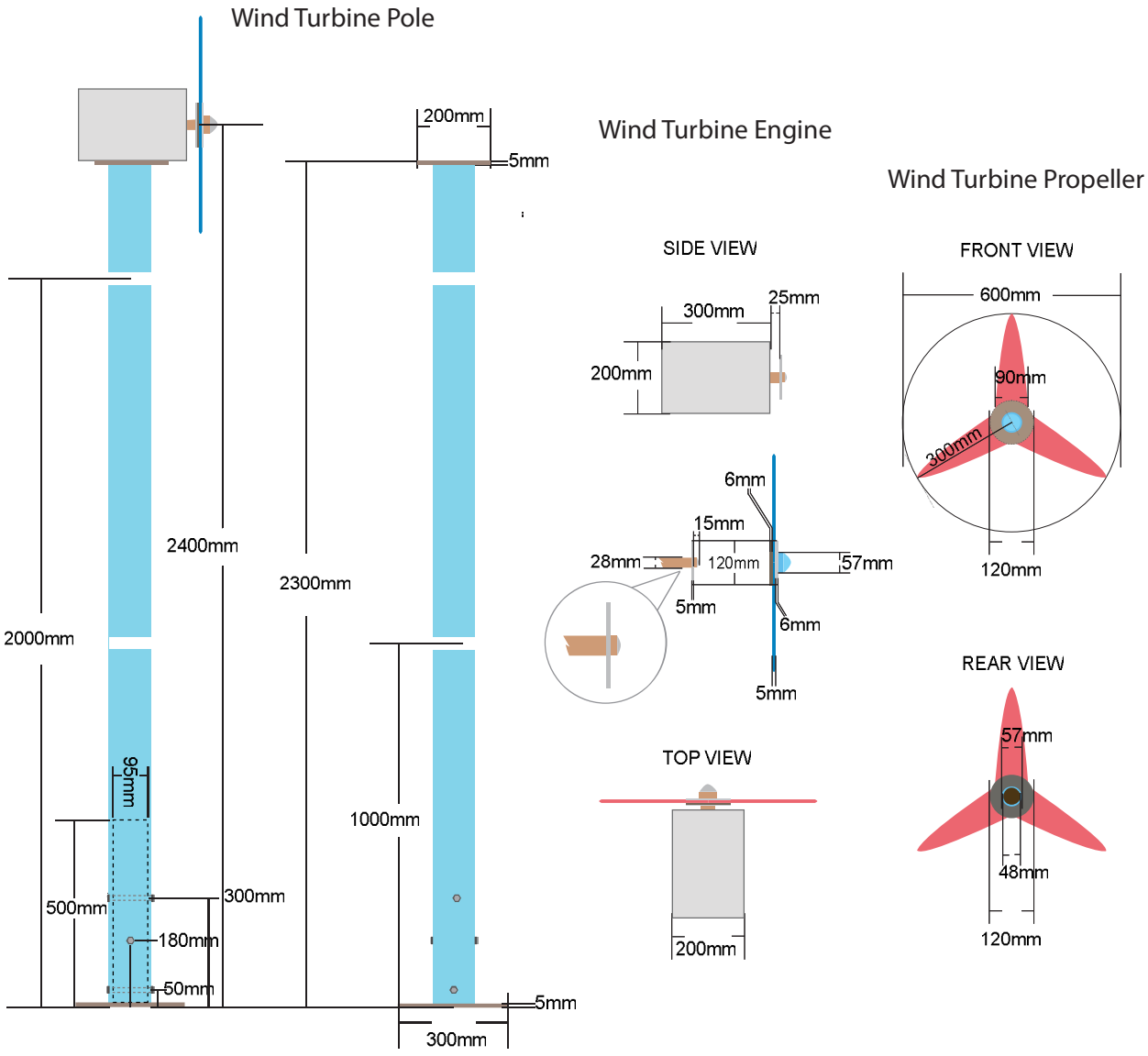


Figure 5: Wind Turbine and Tools

11.1 Wind Turbine Pole is made of a hollow cylindrical Poly Vinyl Chloride (PVC) standard 4-inch pipe with outside diameter of 114 mm and the total length of 2,300 mm after including 5 mm thickness plates at both ends.

11.2 Wind Turbine Engine is a rectangular block with the width of 200 mm, the height of 200 mm, and the length of 300 mm. It is attached on top of Wind Turbine Pole. Steel shaft with diameter of 28 mm is inserted inside Propeller Base made of a cylindrical steel plate with the diameter of 120 mm and the thickness of 5 mm. Propeller Base is used for magnetic attachment during the assembly.

11.3 Wind Turbine Propeller consists of Propeller and Base.

11.3.1 Propeller has 3 blades. The blades are 120 degree apart equally.

11.3.2 Base consists of 2 ring-plates each with the outside diameter of 120 mm, the inside diameter of 57 mm, and the thickness of 6 mm and a cap. The back ring-plate is attached with a magnetic ring-plate for attachment with Propeller Base during the assembly. Propeller is packed by the front ring-plate on one side and the back ring-plate on the other side. The cap has the outside diameter of 57 mm and the inside diameter of 48 mm.

11.4 Wind Turbine Mattress is prepared by the organizer to protect the damage of Hybrid Robot that falls from Wind Turbine Pole. Team members should protect their Hybrid Robot during climbing Wind Turbine Pole by using the prepared Wind Turbine Mattress.

Appendix

1. Colors and Materials of the Floor Surface and Contest Tools

Items	Colors	Pantone (Solid Coated)	Materials
		R-G-B	
Ground Area	Light Brown	7535C	Wood/Painting
		191-185-167	
No Entry Zone	Pink	495C	Wood/Painting
		243-184-189	
Hybrid Robot Start Zone	Red for Red Team	072M	Wood/Painting
		221-54-47	
	Blue for Blue Team	485M	
		0-42-167	
Eco Robot Start Zone	Pink for Red Team	709C	Wood/Painting
		239-103-130	
	Sky Blue for Blue Team	7456C	
		103-115-183	
Slope	Green	339C	Wood/Painting
		0-179-138	
Hill	Orange	158C	
		234-113-37	
Remote Driving Zone	Brown	729C	Wood/Painting
		190-139-94	
River	Sky Blue	298C	Wood/Painting
		39-170-225	

Items	Colors	Pantone (Solid Coated)	Materials
		R-G-B	
Island	Gray	424C	Wood/Painting
		109-110-112	
Down Hill	Light Green	584C	Wood/Painting
		206-213-75	
Wind Turbine Station	Pink for Red Team	709C	Wood/Painting
		239-103-130	
	Sky Blue for Blue Team	7456C	
		103-115-183	
Wooden Fence	Deep Brown	463C	Wood/Painting
		111-76-35	
White Liner	White (Non Shiny)		Non Shiny Sticker
Wind Turbine Pole	Light Blue (Original color of standard 4-inch PVC pipe)		Hollow Cylindrical Poly Vinyl Chloride (PVC) (standard 4-inch pipe) or Other Rigid Materials
Wind Turbine Engine	White		Rectangular Block is made of Wood, Plastic or Cardboard Paper/Painting
Wind Turbine Propeller	Pink for Red Team	709C	Propeller paddles are made of Rubber, Plastic or Cardboard Paper/Painting
		239-103-130	
	Sky Blue for Blue Team	7456C	
		103-115-183	
Accident Protection Guards and Wind Turbine Mattress			Sponge

2. Distribution of Samples of Contest-Related Articles

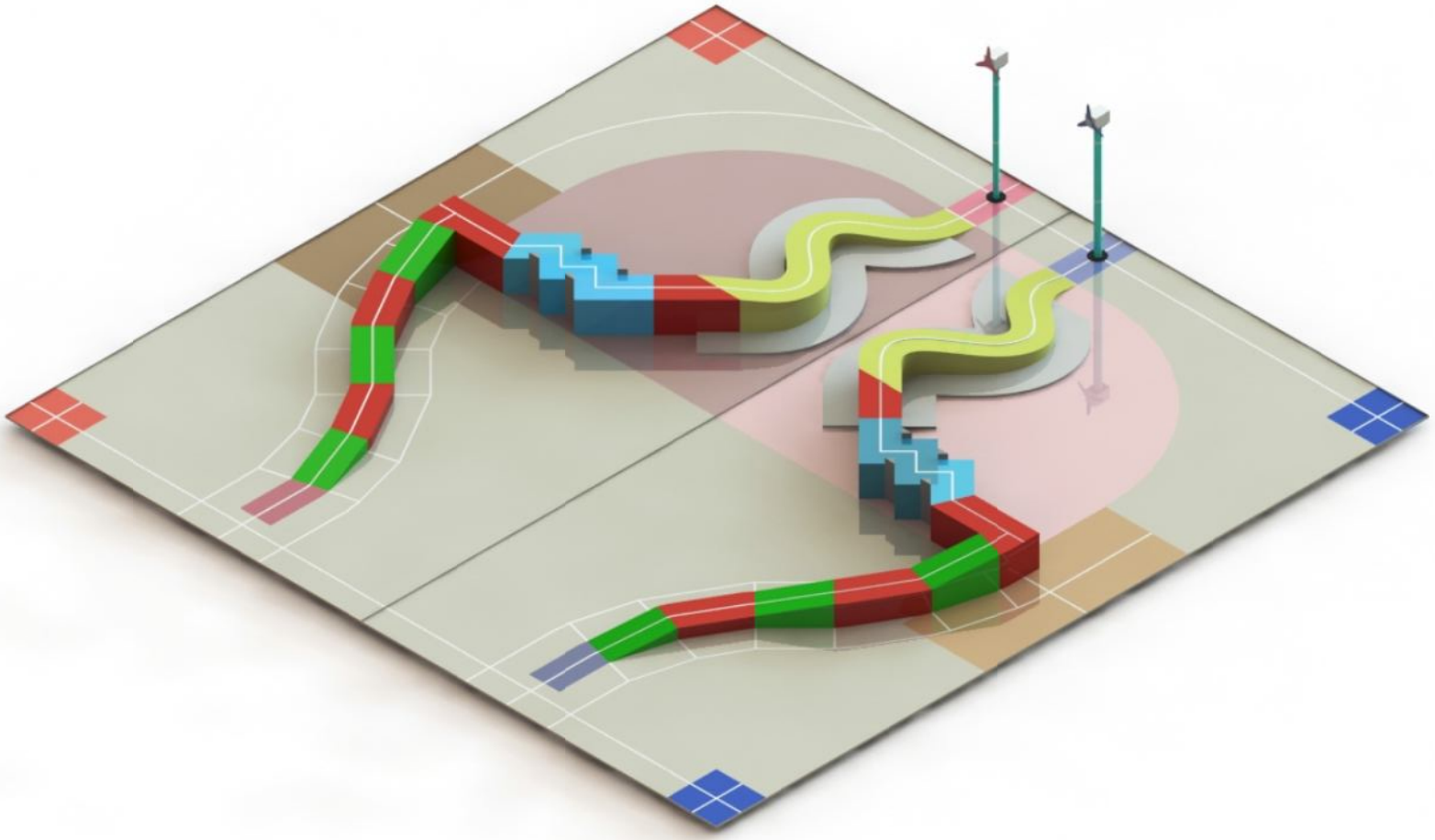
Samples of the materials, etc. used at the ABU Asia-Pacific Robot Contest 2016 Chiang Mai can be sent to the broadcasters of participating countries and regions upon request. The expenses of transportation will be charged to the participating broadcasters.

3. Transporting the Robots

3.1 The organizer will transport the robots of the ABU Asia-Pacific Robot Contest 2016 Bangkok according to a fixed procedure. The details of this procedure will be announced.

3.2 The robots must fit inside a single box with the dimension of 1 mm Width x 1.6 mm Length x 1.4 Height mm for transport. Only one box is used.

Figures



Isometric View

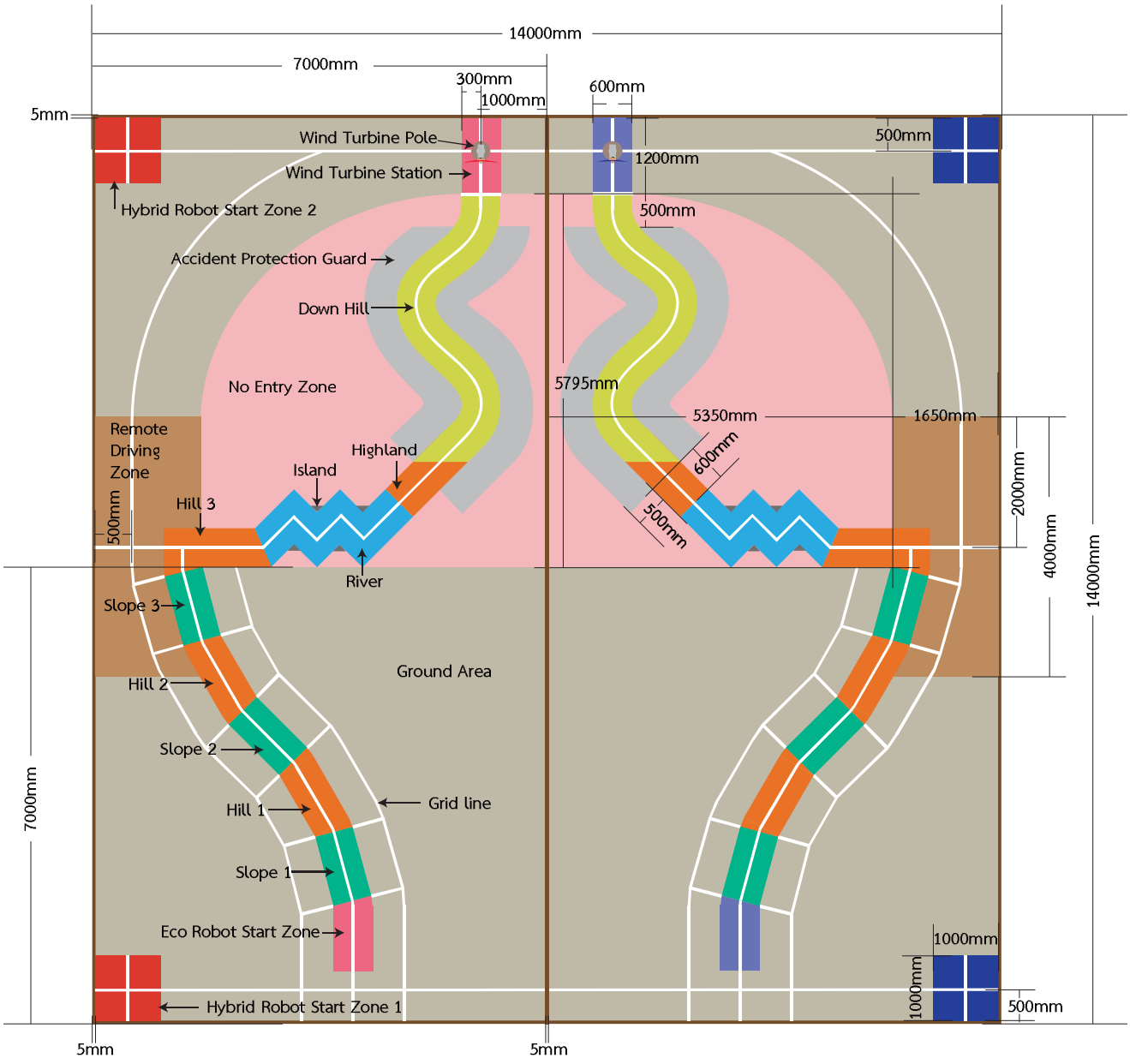


Figure 1: Game Field

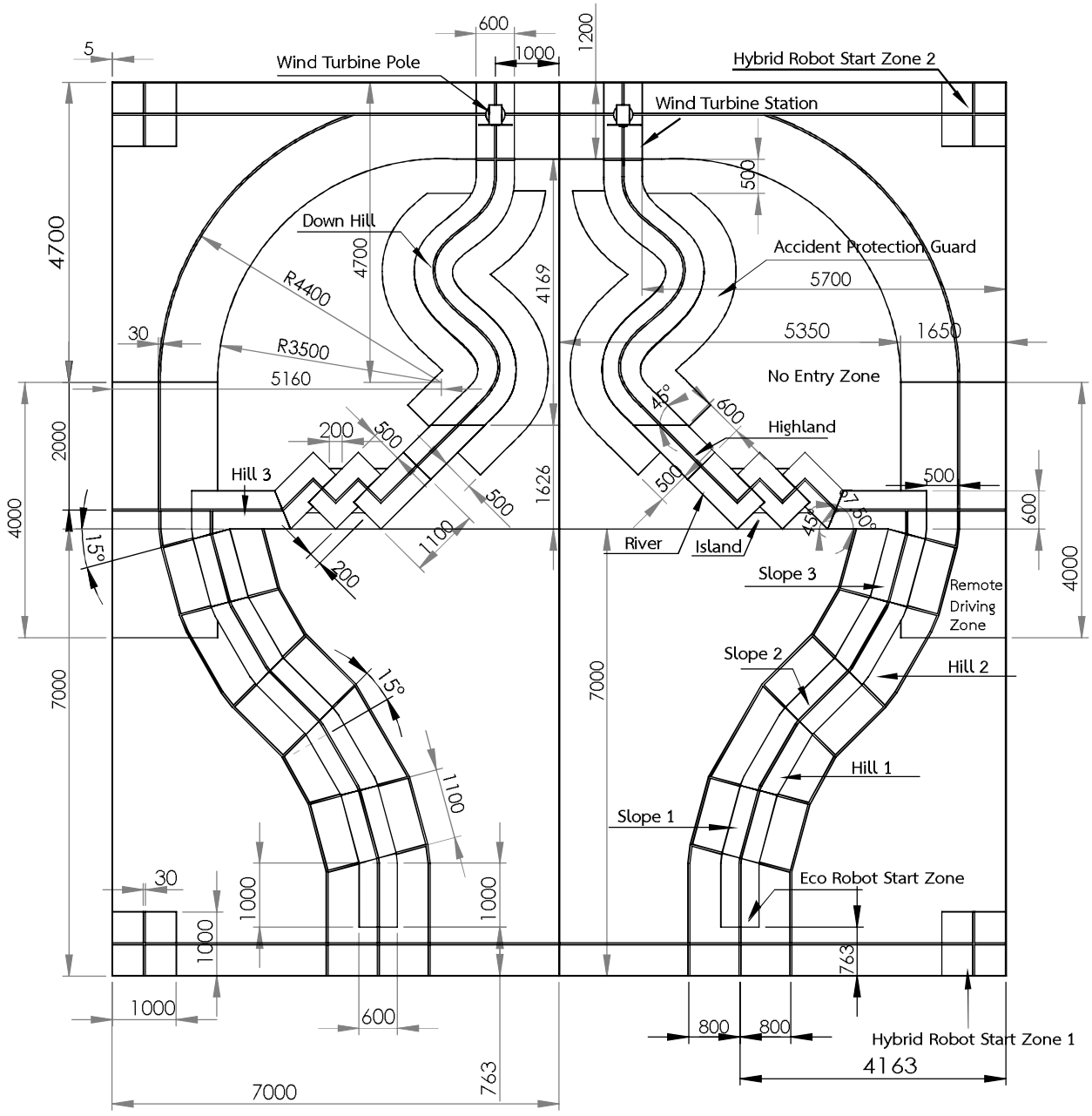


Figure 2 : Game Field

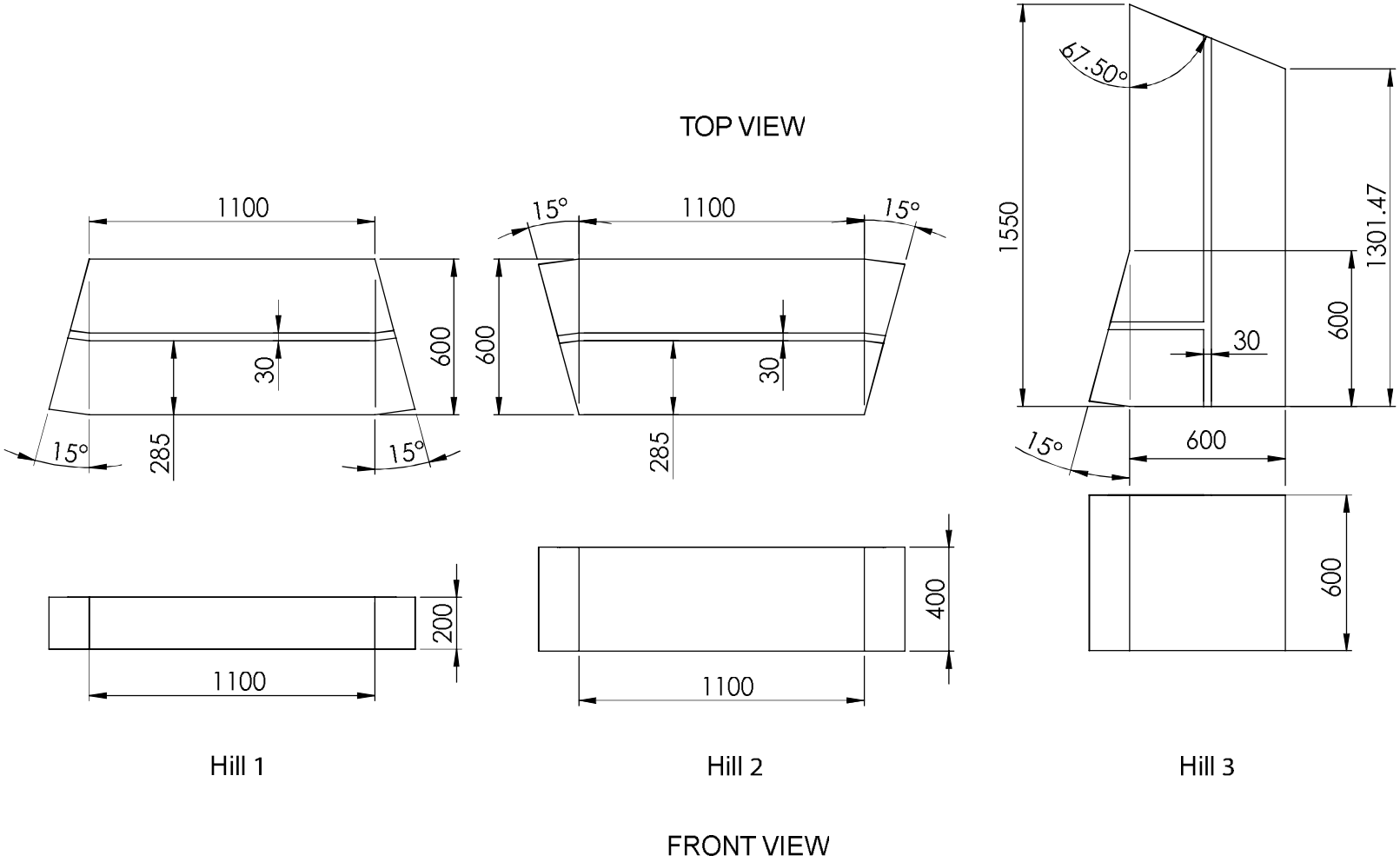


Figure 3 : Hill

Unit Scale : Millimater

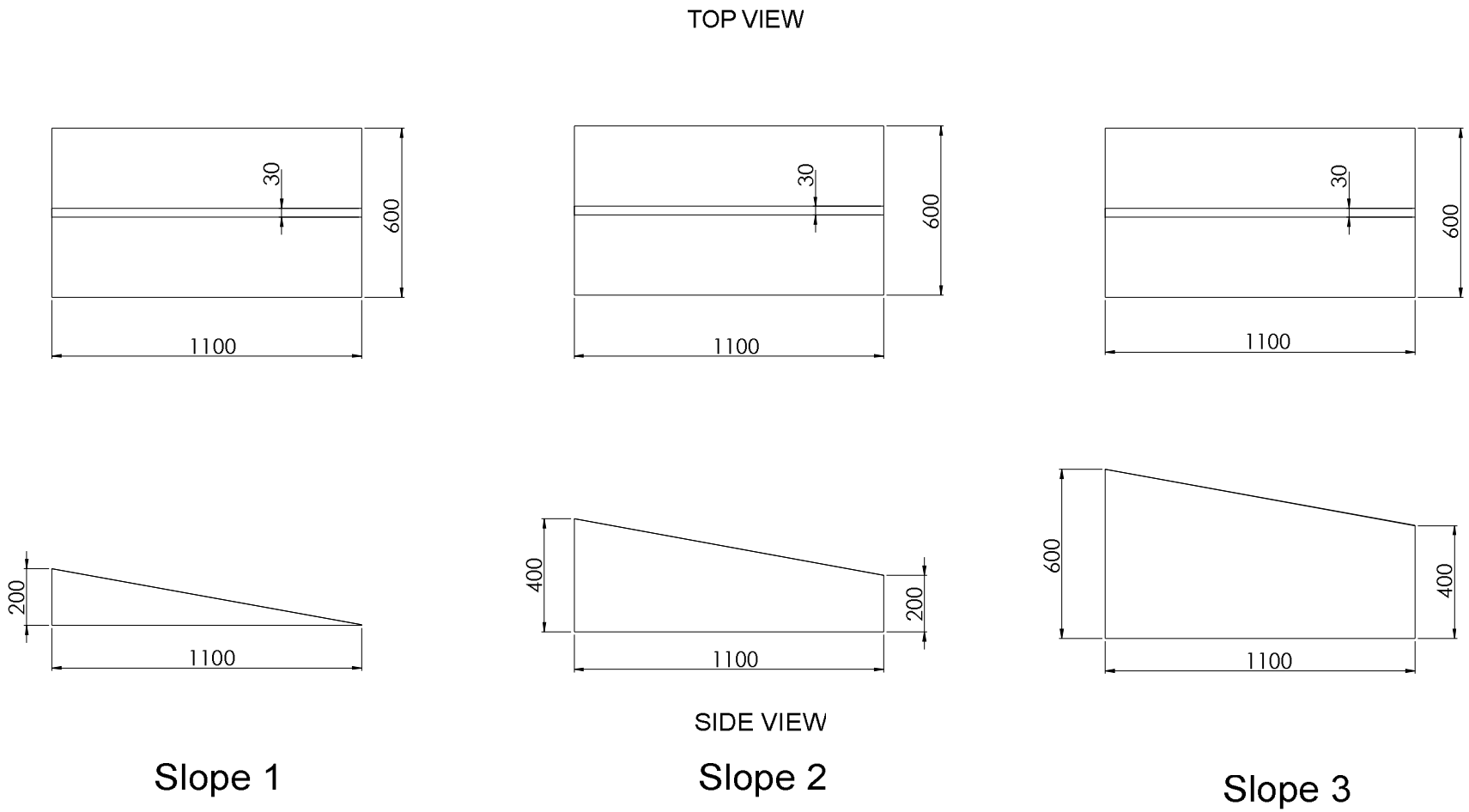


Figure 4 : Slope

Unit Scale : Millimater

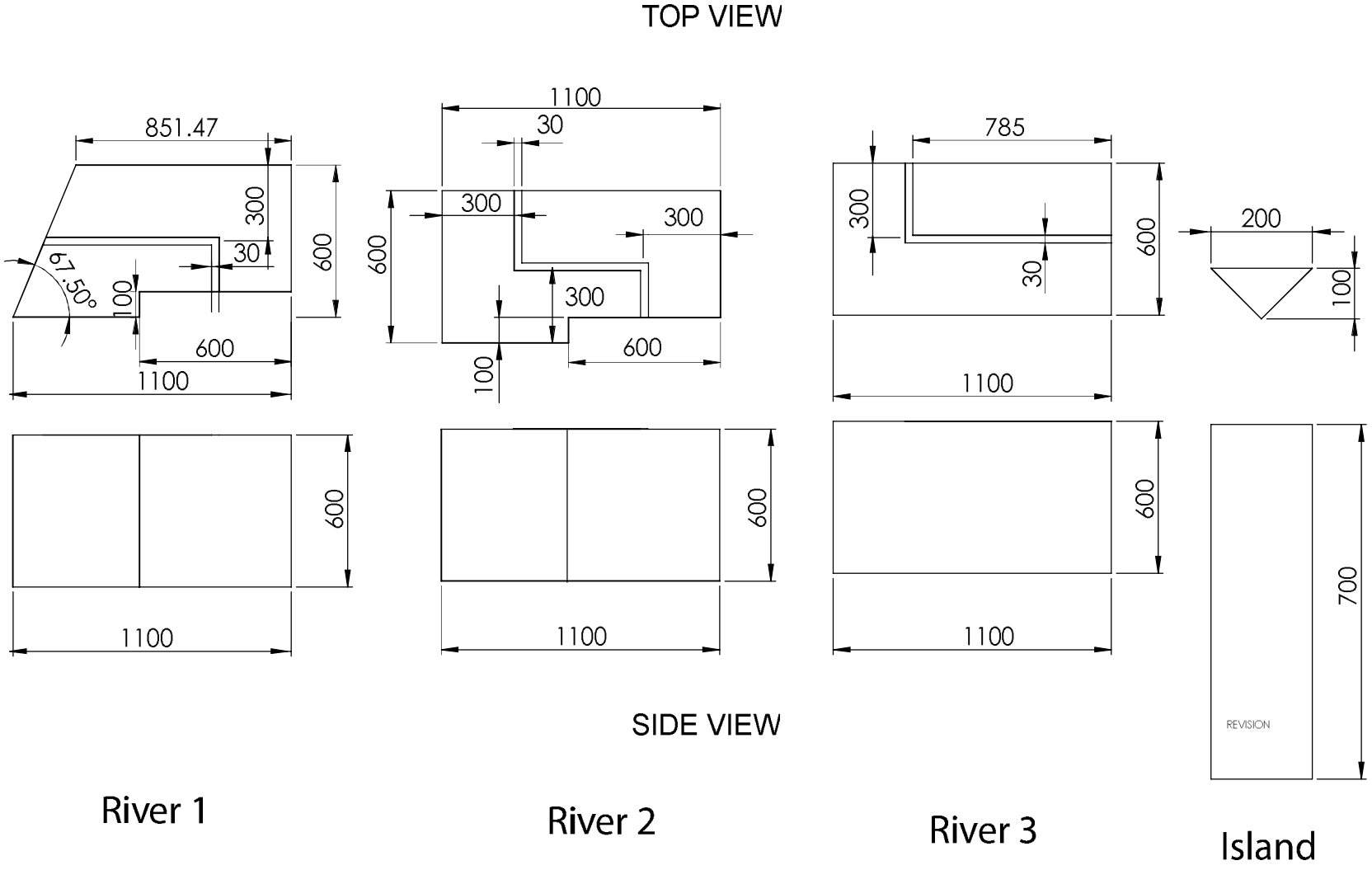


Figure 5 : River and Island

Unit Scale : Millimater

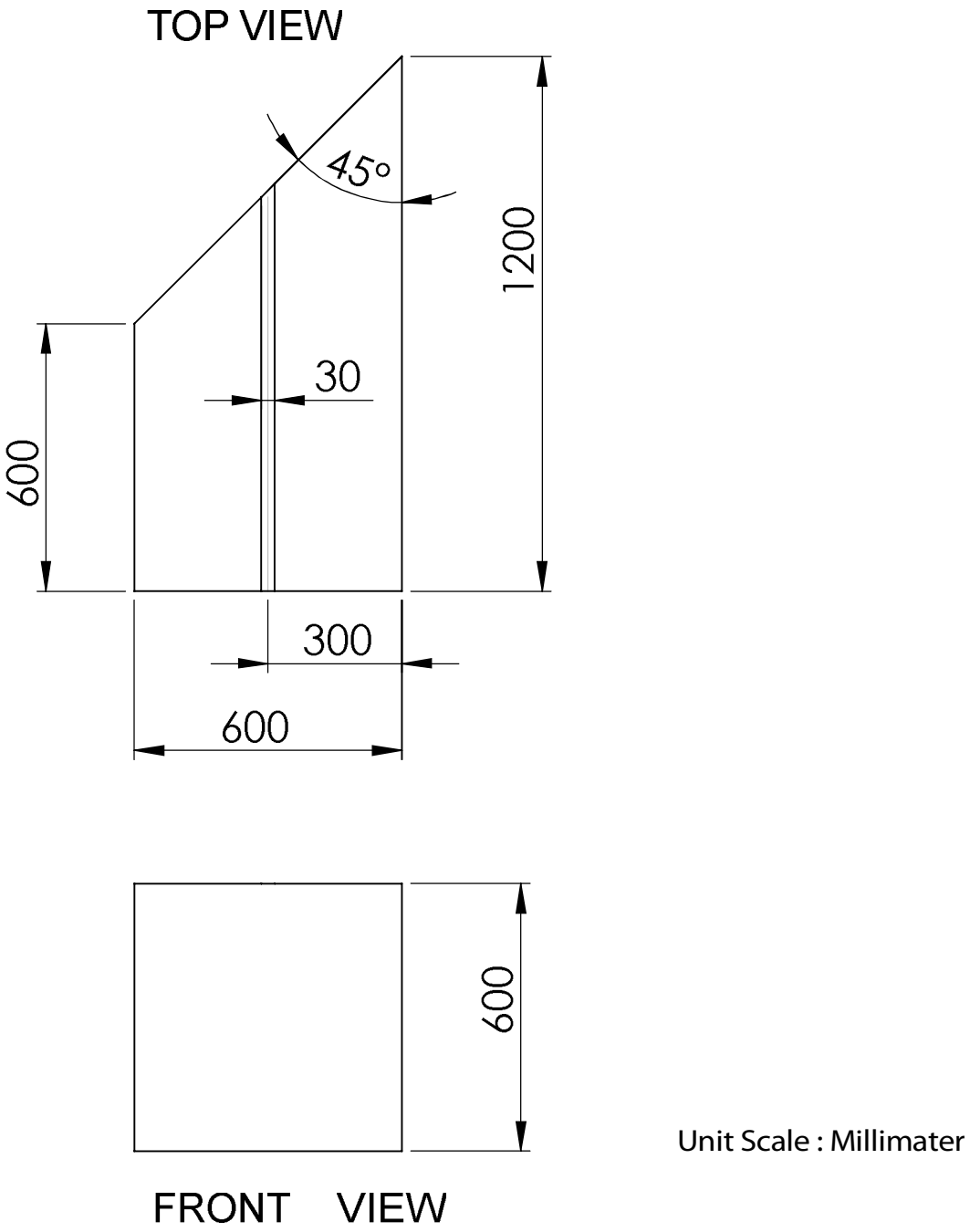
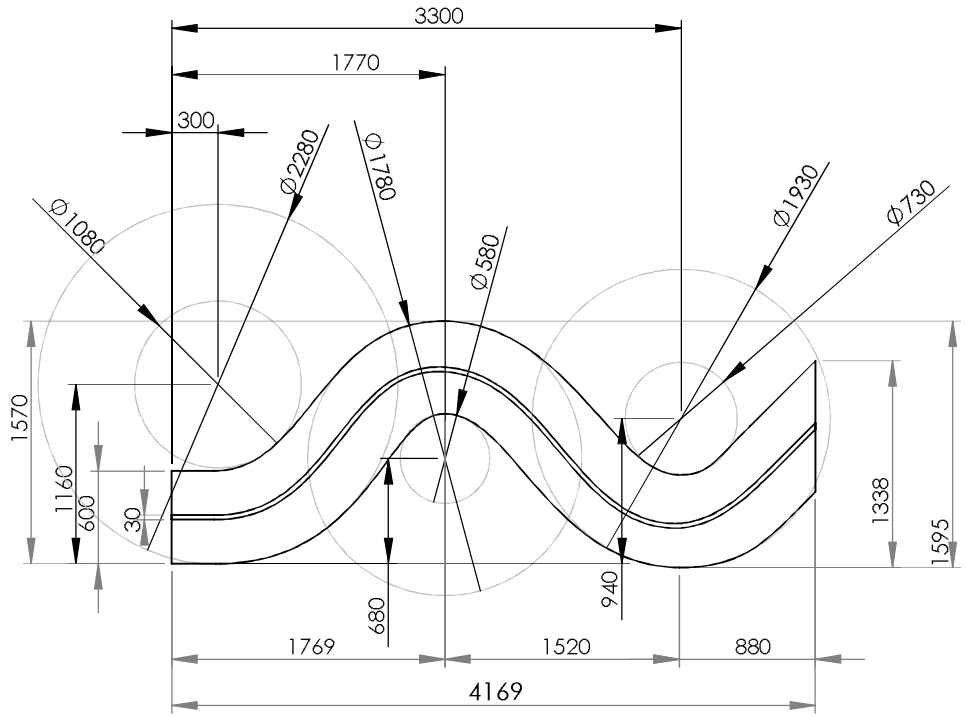
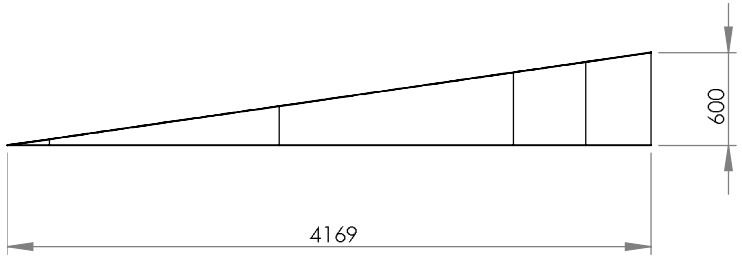


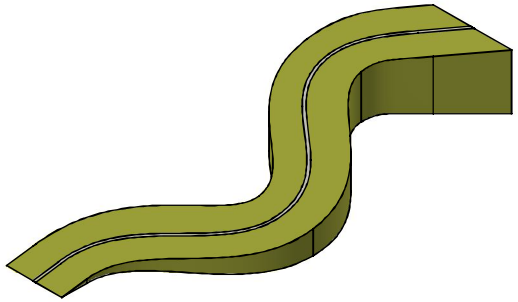
Figure 6 : Highland



TOP VIEW



SIDE VIEW



ISOMETRIC

Figure 7 : Down Hill

Unit Scale : Millimater

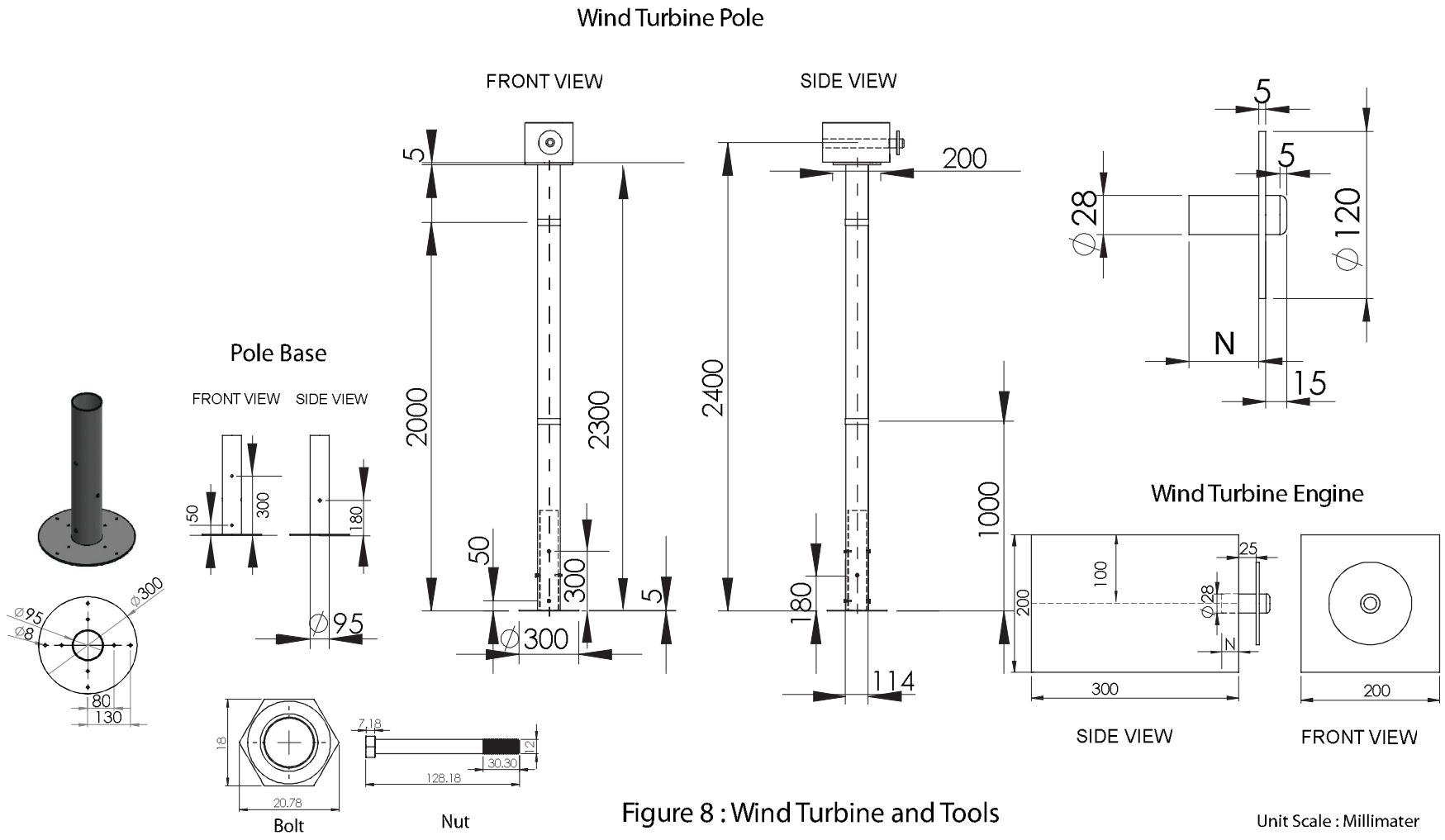


Figure 8 : Wind Turbine and Tools

Unit Scale : Millimater

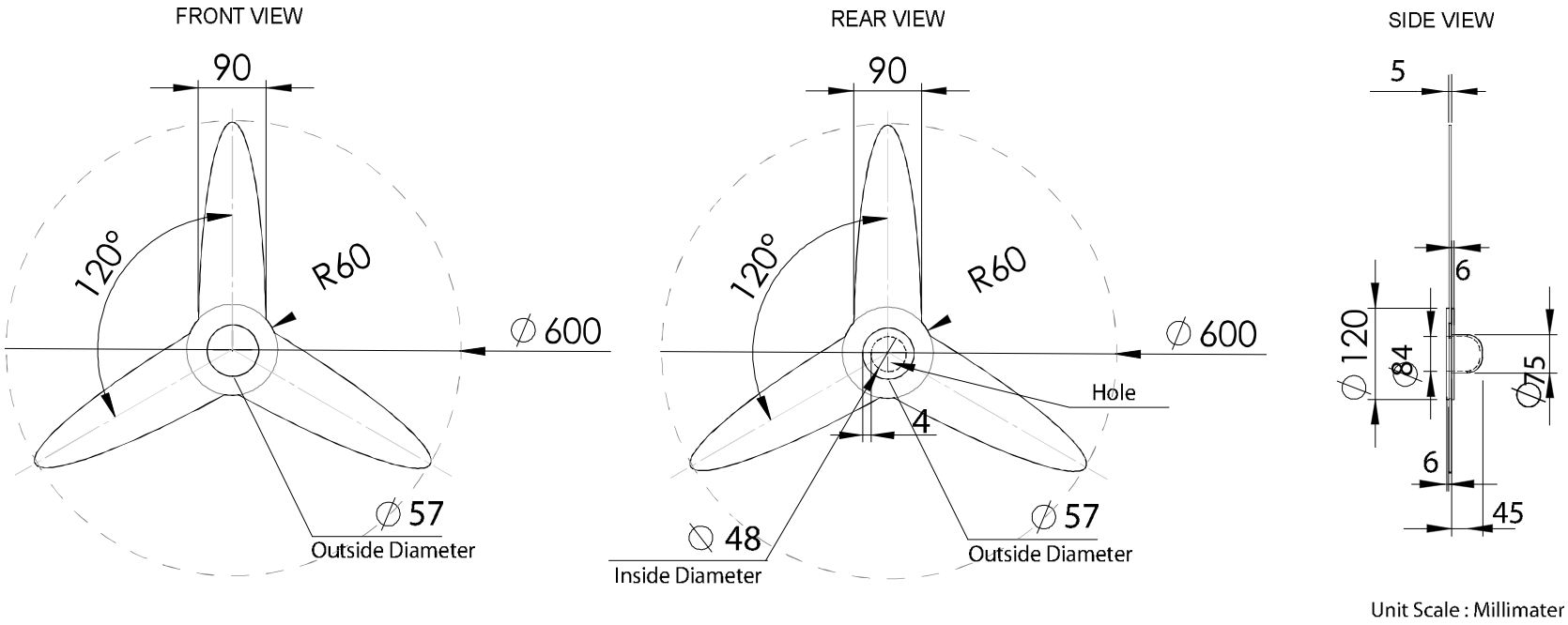
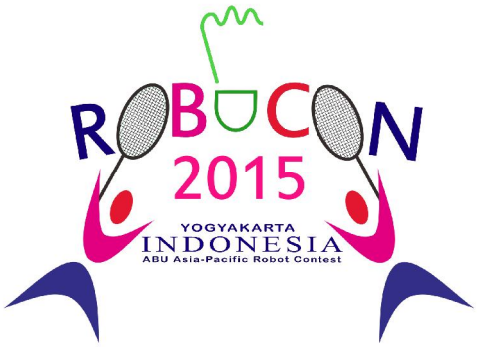


Figure 9 : Wind Turbine Propeller

History of the ABU Asia-Pacific Robot Contest

1	ABU Robocon 2002 Tokyo	2	ABU Robocon 2003 Bangkok
3	ABU Robocon 2004 Seoul	4	ABU Robocon 2005 Beijing
5	ABU Robocon 2006 Kuala Lumpur	6	ABU Robocon 2007 Hanoi
7	ABU Robocon 2008 Pune	8	ABU Robocon 2009 Tokyo

9	ABU Robocon 2010 Cairo 	10	ABU Robocon 2011 Bangkok 
11	ABU Robocon 2012 Hong Kong 	12	ABU Robocon 2013 Danang-Vietnam 
13	ABU Robocon 2014 Pune-INDIA 	14	ABU Robocon 2015 Yogyakarta 
15	ABU Robocon 2016 Bangkok