

12. Quick Box Drop Challenge

Level : Junior / Senior

The Quick Box Drop Challenge simulates a parcel delivery mission across various areas using cubes to represent parcels. The robot must operate fully autonomously, moving to place (drop) the cubes into designated locations according to the mission requirements. The robot must move within the white areas or stay inside the black boundary walls (black lines) specified by the arena, and pass through the designated checkpoints. After completing the mission of placing the required number of cubes, the robot must move and stop at the Finish point to complete the mission. The team with the highest total score will win the competition.

1. Robot Specifications

- 1.1 When fully expanded, the robot's size must not exceed 200 mm x 200 mm, with no restrictions on weight and height.
- 1.2 The robot must operate fully autonomously (no remote control allowed).
- 1.3 Only one microcontroller board is permitted, with no restrictions on the type of control board.
- 1.4 There is no restriction on the number of motors and sensors used in the competition.
- 1.5 The power supply must not exceed 12 volts (no more than 13.5 volts when fully charged) or a maximum of 8 pieces of 1.5-volt AA batteries.
- 1.6 Types and materials used to build the robot structure are unrestricted, such as plastic, wood, foam board, metal, 3D printed materials, perforated plastic plates, etc.
- 1.7 Each team's robot must operate autonomously and complete the mission by itself. Any other form of control—including radio communication, remote control devices, and wired connections—is strictly prohibited. Teams violating this rule will be disqualified from that match and must leave the competition immediately.
- 1.8 The robot may sustain damage during the competition; contestants must inspect and protect it themselves.
- 1.9 Contestants may fully assemble the robot in advance before the competition day, provided that the robot complies with the specifications and requirements stated in the rules.

2. Arena Specifications

- 2.1 The arena is made of vinyl material with dimensions of approximately 120 cm wide by 120 cm long, with no high borders around the arena. The arena floor is white, supported by wood. The robot's path is white, bordered by black lines with a width of 20 mm ($\pm$ no more than 5 mm).

2.2 Checkpoints consist of two (2) yellow stickers measuring 5 cm x 5 cm each (the referee will announce their locations before arena testing on the competition day).

2.3 There are eight (8) green zones, each measuring approximately 15 cm x 30 cm, designated for:

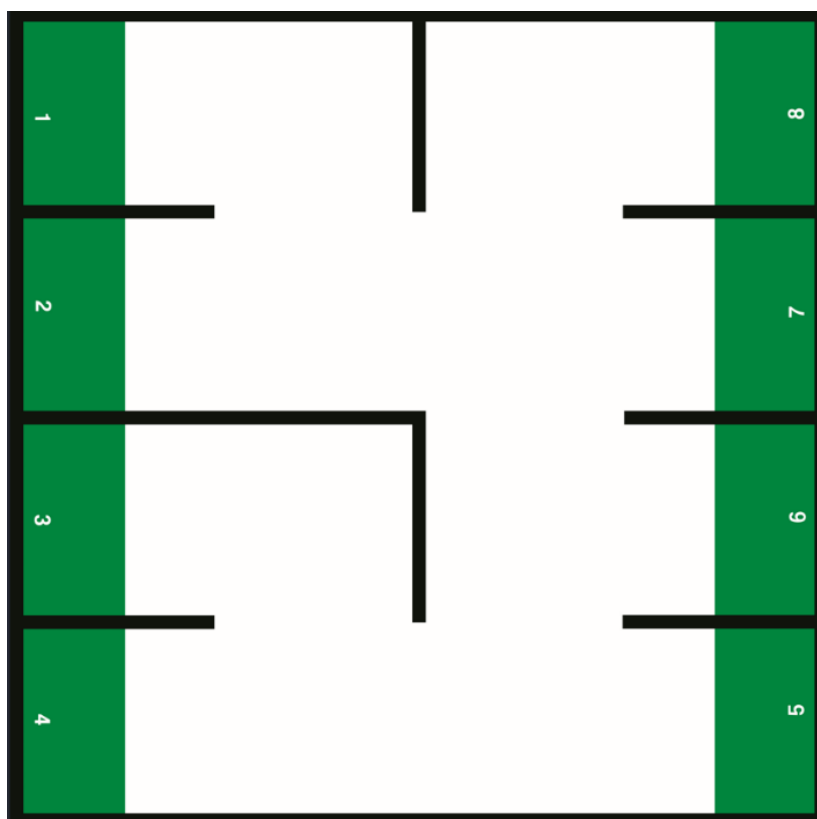
- Parcel (cube) drop-off zones: 4 locations
- Checkpoint areas: 2 locations
- START area (robot starting point) and FINISH area (robot stopping point): 2 locations

The referee will randomly select and announce these locations before the competition.

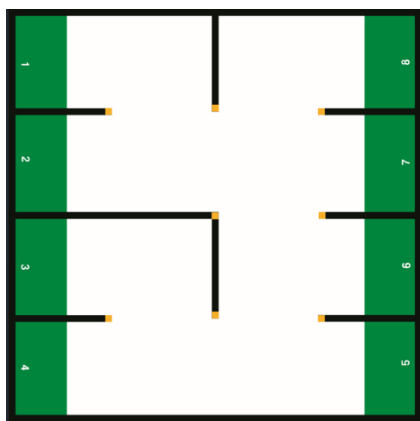
2.4 Arena Installation: The referee must install the arena to minimize wrinkles in the vinyl sheet or joints of the vinyl backing support. Any wrinkles or gaps in the vinyl backing joints shall be considered obstacles during the competition.

2.5 Relief packages are cube-shaped, with equal width, length, and height on all sides measuring 2 cm each ($\pm$ no more than 3 mm), and weighing no more than 100 grams each.

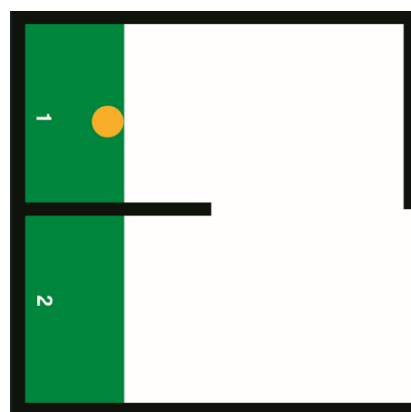
2.6 Obstacles are cube-shaped, with equal width, length, and height on all sides measuring 2 cm each ($\pm$ no more than 3 mm), weighing no more than 100 grams each, with a total of 8 pieces placed along the corners of the robot's pathway.



Example of Arena Obstacle Placement



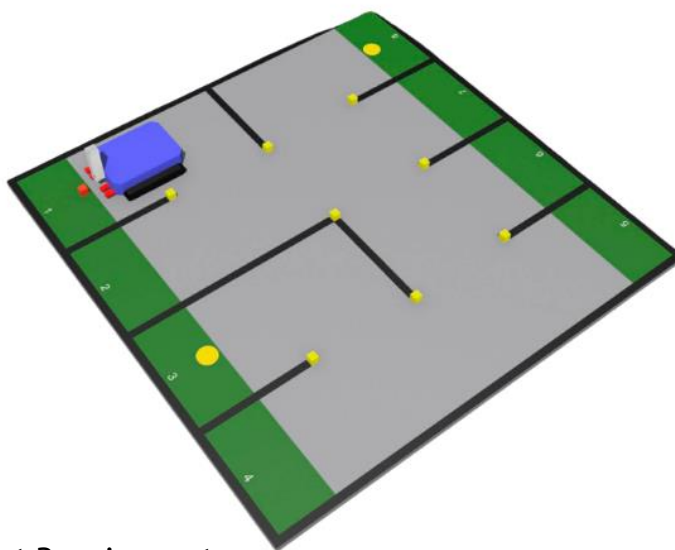
Example Check Point Placement



3. Competition Procedure

3.1 Mission Characteristics

The robot must load the cubes before departing from the START point (randomly selected by the referee), carrying no more than 4 pieces. It must travel along the designated path, ensuring that the robot's wheels do not straddle the black lines or black areas, and transport the materials to place them in various areas randomly assigned by the referee. Once the mission is completed, the robot must travel back to the FINISH point (randomly selected by the referee).



3.2 Competition Start Requirements

3.2

3.2.1

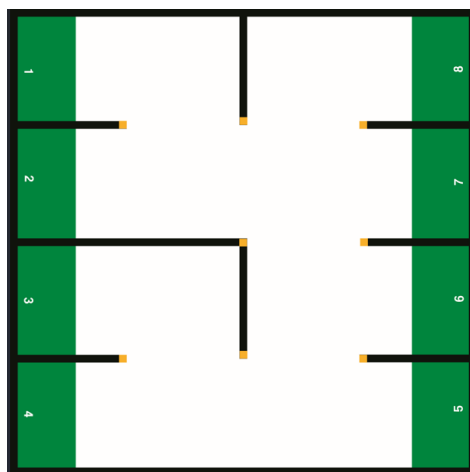
- * START area (robot starting point): 1 location
- * FINISH area (robot stopping point): 1 location
- * Cube drop-off areas: 4 locations
- * Checkpoints (yellow circular stickers): 2 locations

3.2.1 Before the first round of the competition begins, the referee will call all contestants together to brief them on the competition rules. Afterwards, contestants will be given at least 45 minutes to test the arena. Important information announced by the referee will include:

START area (robot starting point):	1 location
FINISH area (robot stopping point):	1 location
Cube drop-off areas:	4 locations
Checkpoints (yellow circular stickers):	2 locations

Randomization method : Number drawing.

Mission sequence : From the START point, travel through the 2 checkpoints first, then proceed to drop off the cubes at the 4 locations (performing the mission in the sequence randomly determined by the referee), and finally stop at the FINISH point. The mission must be performed in an alternating side-to-side manner; if it starts on the left side, the next task must be performed on the right side, alternating back and forth.



Example of Drawing Lots:

- | | |
|--|-------------------------|
| 1. Draw lots for the START point first. | Suppose it is number 5. |
| 2. Draw lots for Check Point 1 (1, 2, 3, 4). | Suppose it is number 1. |
| 3. Draw lots for Check Point 2 (6, 7, 8). | Suppose it is number 8. |
| 4. Draw lots for Cube Drop-off Zone 1 (2, 3, 4). | Suppose it is number 3. |
| 5. Draw lots for Cube Drop-off Zone 2 (6, 7). | Suppose it is number 7. |
| 6. Draw lots for Cube Drop-off Zone 3 (2, 4). | Suppose it is number 4. |
| 7. The remaining Cube Drop-off Zone 4 | is number 6. |
| 8. The remaining FINISH point | is number 2. |

Mission Sequence Summary:

START Point:	Number 5
Check Point 1:	Number 1
Check Point 2:	Number 8
Cube Drop-off Zone 1:	Number 3
Cube Drop-off Zone 2:	Number 7
Cube Drop-off Zone 3:	Number 4
Cube Drop-off Zone 4:	Number 6
FINISH Point:	Number 2

3.2.2 Contestants must line up in an orderly queue according to their turn and follow the instructions of the field referees. Each team may practice only within the allotted time. Once the time is up, they must leave the arena immediately to give the next team an opportunity. Contestants should demonstrate sportsmanship, kindness, and respect toward other teams, without cutting in line or causing disruption in the competition area. Such practice sessions are solely for arena testing and do not count toward official timing or scoring.

3.2.3 Contestants must develop and write robot control programs using offline software only. Connecting to the internet, external networks, or accessing any cloud systems during the competition is strictly prohibited.

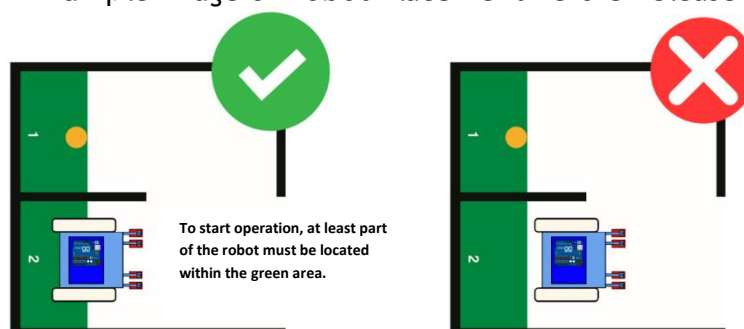
3.2.4 When the referee calls a team to enter the arena, contestants must arrive promptly at the scheduled time and place their robot in the arena within the specified time limit. Exceeding the time limit may result in disqualification or penalties at the discretion of the committee.

3.3 Match Start

3.3.1 Upon expiration of the robot testing time, all teams must submit their robots for specification inspection and place them at the locations designated by the referee.

3.3.2 When the referee calls a team to compete in the arena, contestants are allowed 10 seconds to set up their robot on the field. Contestants may load cubes as desired, but not exceeding 4 pieces at a time.

Example Image of Robot Placement Before Release

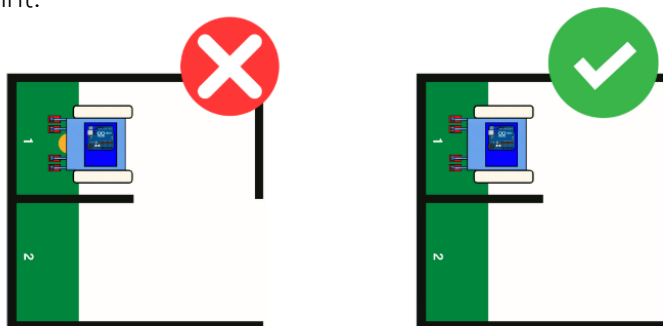


3.2.1 When starting the competition, the robot will be placed at the START point. The contestant who presses the button to start the robot must stand at the location designated by the referee. Upon hearing the signal from the referee, the designated contestant must press the button to start the robot so that it performs the assigned mission. Contestants are not allowed to touch the robot; if the robot is touched, the referee will force a retry.

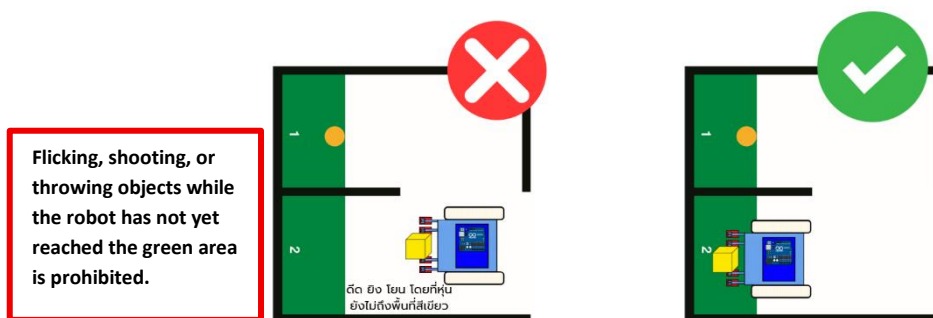
3.3 Mission Execution

The robot must move through the arena passing through the designated checkpoints. Contestants will receive 10 points per checkpoint.

- There are 2 checkpoints.
- Passing a checkpoint means any part of the robot must cover or touch the checkpoint.



3.3.1 When the robot reaches the designated parcel (cube) drop-off area, at least part of the robot must reach the green zone in order to release the cubes into the specified area. As long as any part of the cube is on the drop-off area or the green zone, contestants will receive 15 points, which will be recorded immediately.



3.3.2 If the robot crashes into, touches, or hits an obstacle, points will be deducted as follows:

- Hitting the first 2 obstacles: 5 points deducted per obstacle.
- Hitting subsequent obstacles (3rd–8th): 1 point deducted per obstacle.

- 3.3.3 When an obstacle is hit, neither the referee nor the contestant may remove that cube from the arena; it shall remain as an obstacle for the competition. If the robot hits the same obstacle again, no points will be deducted.
- 3.3.4 Contestants may request to stop the competition at any time, but the time will be recorded as 2 minutes, and the score awarded will be the latest score achieved.
- 3.3.5 Scoring is based on passing through checkpoints, counting the number of cubes correctly placed at the designated locations, and returning to the FINISH point. Points are awarded immediately upon successful completion of a task. Contestants are not required to place all cubes or pass through all checkpoints.
- 3.3.6 Reaching the FINISH point awards 20 points. The contestant who pressed the start button must go and press the button to stop the timer.



- 3.3.7 During the robot's mission execution:

- The robot must not touch the black lines for more than **5** seconds. If it exceeds **5** seconds, the referee will force a retry. Alternatively, if there is an intent in the programming to have the robot follow the black lines, the referee will also force a retry.
- If the robot goes out of the arena (any wheel touches the floor outside the arena), the referee will force a retry.
- For the mission tasks—moving through checkpoints and dropping cubes—they must be performed in the designated sequence. If done out of sequence, no points will be awarded for that attempt.
- If tasks are performed in sequence but not fully completed (for example, passing through the **2** checkpoints and correctly dropping cubes at **2** locations in the proper sequence), the robot can proceed to stop at the FINISH point, and points will be calculated based on the completed tasks.

3.4 Match Ending and Time Stoppage

3.4.1 Mission Completion

3.4.1.1 The competition ends when the robot moves into the FINISH area, with at least part of the robot located within the boundary of said area to be considered a complete mission. Additionally, the robot must come to a complete stop before the time is stopped.

3.4.1.2 The competition time expires, or the contestant requests to stop the competition.

3.4.2 Time Stoppage Procedure

3.4.2.1 Before stopping the time, the contestant responsible for releasing the robot will be the one to press the time-stoppage button.

3.4.2.2 The time stoppage is complete only when all steps are fully followed. If procedures are not followed, the referee may not certify the time or may consider it at the committee's discretion.

3.4.3 Timer Malfunction or Force Majeure

3.4.3.1 In the event of a malfunction of the timer, electrical system, scoring calculation program, or any other force majeure beyond the control of the competition organizers that affects time recording or scoring results, the committee has the authority to take appropriate action to ensure fairness for all teams.

Guidelines for Consideration and Action:

1. Re-run the competition for that round.
2. Use data from backup systems or other recording evidence for consideration.
3. Cancel the competition results for that round.
4. Determine other corrective measures as deemed appropriate by the committee.

The committee's ruling in such cases shall be final.

3.5 Retry

3.5.1 Retries are divided into 2 cases:

1. Restarting the robot.
2. Robot malfunction.

If the robot is damaged, unable to move, or experiences other malfunctions that prevent it from continuing the mission, contestants must notify the referee and perform a Retry by returning the robot to start over at the START point. Additional details are as follows:

1. Contestants must return to the START point every time.
2. Reset the scores earned, but obstacle collision penalties will not be reset and will continue to accumulate.
3. Retrieve the cubes that have already been used for missions and reload them to play again.
4. Changing the program or the robot's walking route is strictly prohibited.

3.5.2 General Conditions for a Retry

1. Requesting a Retry must be approved by the referee beforehand every time.
2. When a Retry occurs, the competition time will not stop and will continue to run, unless the referee deems it appropriate to stop the time as a special case.
3. Every Retry in all cases will be recorded, and points will be deducted according to the established criteria.
4. Contestants are prohibited from intentionally using a Retry to gain an advantage in reducing distance or competition time. If detected, disqualification or point deductions will be considered at the committee's discretion.

4. Judging and Scoring Category

4.1 Statistics Recording and Score Calculation

The score calculation for recording competition statistics shall be in accordance with the following criteria:

Team statistics: Time score + Mission score - Obstacle collision penalties - Number of Retries

4.1.1 Time Score

The time score is calculated as follows:

Time Score = Total Time (120 seconds) — Time Used to Complete the Mission

However, if any team fails to complete the mission according to the specified conditions or fails to bring the robot to the FINISH point, they will not receive a time score, and the time score will be 0 points.

Examples:

Team A: Completed the mission, used 45 seconds → Score: $120 - 45 = 75$ points.

Team B: Incomplete mission, used 90 seconds → Score: $120 - 90 = 30$ points.

Team C: Robot unable to move, used the full time of 120 seconds → Score: $120 - 120 = 0$ points.

4.1.2 Mission Score

The mission score is calculated from the sum of:

Mission Score = Checkpoints Passed + Cubes Successfully Placed in Designated Areas + FINISH Point Reached

Scoring criteria:

- Passing checkpoints: × 10 points each.
- Dropping cubes in designated areas: × 15 points each.
- Reaching the FINISH point: 20 points.

Team statistics = Time score + Mission score - Obstacle collision penalties - Number of Retries

example

Team	Time taken	Time score	Checkpoint	Cube	FINISH	Obstacle collision	Retry	Statistics
A	45.45 วินาที	$120 - 45.45 = 74.55$	Passed 2 checkpoints $2 \times 10 = 20$	Understood 4 ลูก $4 \times 15 = 60$	20	0	2	$74.55 + (20 + 60 + 20) - 2 = 172.55$
B	50.06 วินาที	$120 - 50.06 = 69.94$	Passed 2 checkpoints $2 \times 10 = 20$	Understood 2 ลูก $2 \times 15 = 30$	20	$2 \times 5 = 10$	1	$69.94 + (20 + 30 + 20) - 10 - 1 = 128.94$
C	90.32 วินาที	$120 - 90.32 = 29.68$	Passed 2 checkpoints $1 \times 10 = 10$	Understood 2 ลูก $2 \times 15 = 30$	20	5 ลูก $2 \times 5 = 10$ $3 \times 1 = 3$	4	$29.68 + (10 + 30 + 20) - 13 - 4 = 72.68$

4.2 Match Evaluation

4.2.1 Number of Rounds and Statistics Used for Evaluation

Each team will compete twice, with the following statistical criteria used for evaluation:

1. Team's Best Score: Refers to the highest total score obtained from both competition rounds, considering only the single attempt with the highest score.
2. Total Cumulative Score: Refers to the sum of scores from both competition rounds.

4.2.2 Ranking Methods

1. Rank primarily by the team's best score.
2. If the team's best scores are equal, rank by the total cumulative score.
3. If they are still equal, it shall be at the committee's discretion.

The committee will inform contestants prior to the competition which format will be used for judging.

5. Standards and Technical Specifications Category: Modification of Equipment and Robot Repair

5.1 Robot Repair During Practice

1. Contestants may repair, adjust, or replace robot parts during the designated practice time.
2. Repairs or adjustments must be carried out within the area designated by the committee and must not obstruct or disturb other teams.
3. Safety principles must be observed; using equipment that poses a hazard to others or the competition arena is strictly prohibited.
4. Practice sessions do not count as time or score recording.
5. Upon the end of the practice time, contestants must immediately stop repairs and remove the robot from the arena as instructed by the referee.

5.2 Robot Repair During Competition (In Case of Malfunction)

1. In the event of a robot malfunction during the competition—such as a broken motor, disconnected wiring, electrical system failure, or non-working equipment—contestants may request to fix or repair it.
2. Repairs or adjustments to the robot can only be made within the competition time of that specific round, and the competition clock will not stop.
3. Contestants must notify the referee before every repair and carry it out under the referee's supervision.
4. Bringing new parts or replacement equipment is prohibited unless authorized by the committee.
5. If the repair takes up the remainder of the competition time, the round will be terminated, and results will be recorded based on the current state.
6. The committee's decision in such cases shall be final.

5.3 Battery Replacement

1. Contestants are permitted to replace batteries only during intervals between competition rounds or at times specified by the committee, and must be done with the referee's knowledge.
2. Once contestants submit their robot for readiness inspection before the start of a round, battery replacement is strictly prohibited under any circumstances unless authorized by the committee.

3. Battery replacement is prohibited while competing in that round.
4. Violations may result in a 5-point deduction, termination of the round, or disqualification at the committee's discretion.

6. Competition Regulations and Discipline Category

6.1 Verification and Certification of Scores

Upon completion of each competition round, contestants must verify the score with the referee to confirm scoring accuracy. If correct, contestants must sign to officially acknowledge the score.

6.2 Robot Storage After Competition

After completing each round, contestants must return their robot to the designated storage area and must not remove the robot from said area until the committee announces permission to collect robots simultaneously.

6.3 Protests

6.3.1 Filing a Protest and the Spirit of the Competition

- If contestants have questions regarding scores, referee decisions, or referee conduct, they may file a protest according to the specified procedure.
- However, this competition aims to develop Thai youth in technological skills, discipline, and morality. It encourages contestants to learn to accept decisions, be gracious in defeat and victory, and practice forgiveness—essential qualities of good athletes and citizens.
- Contestants should exercise their right to protest with reasoning, politeness, and respect for the committee's adjudication process.

6.3.2 Protests must be made in writing by the team captain and submitted to the committee within no more than 20 minutes after the score announcement for that round.

6.3.3 Protests must relate exclusively to events that occurred during their own team's competition.

6.3.4 During the protest review, the original decision remains in effect until the committee issues a new ruling.

6.3.5 The committee's ruling following a protest review shall be final.

6.4 Arena Testing Time

Arena testing time before the first round shall be no less than 45 minutes, and testing time after the completion of the first round shall be no less than 20 minutes.

7. Authority for Consideration

7.1 Unspecified Cases

Any situation or case arising during the competition that is not specified in these rules shall be at the discretion of the committee.

7.2 Committee Decisions

The decisions of the committee shall be final.