

Beyond Botball 2005 Rules & Game Review



Rules Update History

- 12/17/2004 Game rules first released



Robot Construction Rules

1. A teams entry (all materials placed on the gameboard) must mass less than 4.5kg (10 pounds).
2. A teams entry (all materials placed on the gameboard) must fit within the starting box which is 38cm long by 30.5cm wide by 30.5cm high (15" long by 12" wide by 12" high).
3. The team's entry may not contain or release pressurized materials at greater than 7 bar (100 psi).
4. The team's entry may not release any liquids during the game, or before during or after the game while the team is at the game table.
5. The team's entry may not release any gasses while at the game table that are considered hazardous by the judges, or are at a temperature below 0°C (32°F) or above 50°C (122°F).



Robot Construction Rules (2)

6. Robots may not contain features (manipulators, protrusions or materials) that are designed to or are deemed by the judges likely to cause damage or destruction to the game board or to a reasonably constructed opponent robot.
7. A team's entry may not contain features (manipulators, protrusions or materials) that are designed to or are deemed by the judges likely to cause jamming or entanglement of a reasonably constructed opponent robot. Blocking and containing of opponent robots is allowed.
8. Robots must operate autonomously (no external power or control from outside of the game board area will be allowed).
9. Each team may only have a maximum of four independent structures on the game board at a time.
10. Each robot must have a name suitable for broadcast over a PA system.



Robot Construction Rules (3)

11. The contents of the 2005 Botball kit and all previous Botball kits are all legal parts for the 2005 Beyond Botball competition, however participants are NOT limited to those parts.
12. Team entries may NOT contain parts that may reasonably be confused with game pieces (entries may not contain orange foam balls, ping pong balls, TP tubes, or pieces of plumbing obviously similar in size and shape to any parts of the game board or game pieces).



Arena Construction Tools

- **Straight edge**
- **Paper grocery bag, cut off to make a ping-pong ball painting chamber**
- **Measuring tape or other rule**
- **Pencil**
- **Rubber mallet (for PVC)**
- **Scissors**
- **PVC pipe cutter** (a simple ratcheting knife that cuts PVC both cleanly and accurately)
- **Plastic handle for paint cans (Home Depot)**
(keeps paint off fingers and reduces spatter)



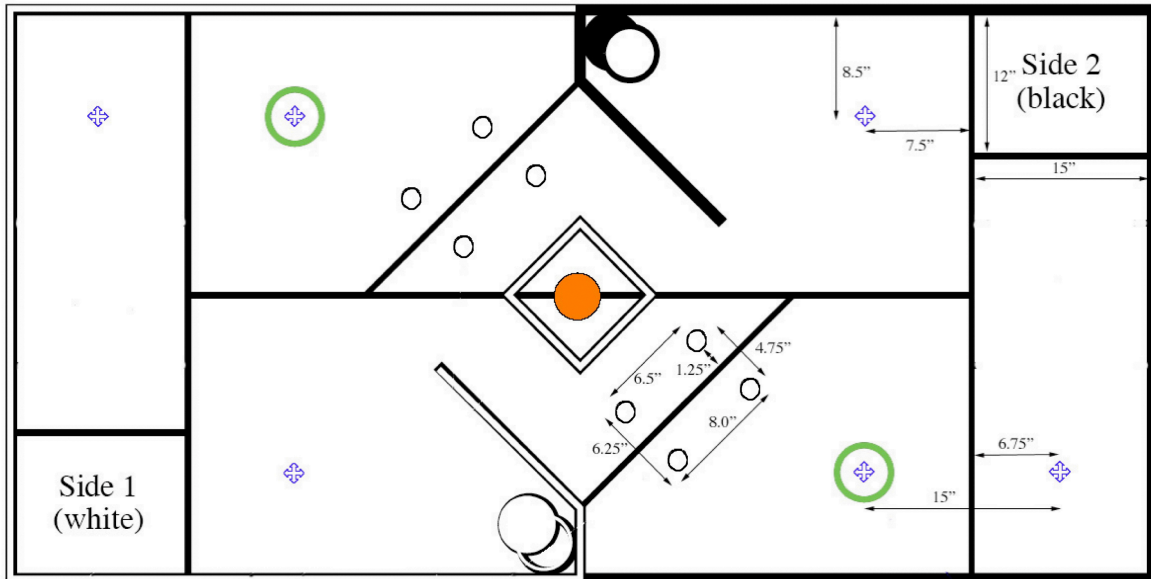
Arena Construction

- 1" PVC pipe (approx 1 5/16" OD)
 - 2 – 45" A (1 black 1 white)
 - 4 – 45.75" B (2 black 2 white)
 - 2 – 5.25" C (1 black 1 white)
 - 2 – 17" D (1 black 1 white)
 - 4 – 4 3/4" E (all black)
- 8 90 degree PVC 1" corners (2 black 6 white)
- 2 PVC 1" Ts (1 black 1 white)
- 2 PVC 1" 45° connectors (1 black 1 white)
- 2 4" connectors* (both painted flat green)
- 2 4" 45° connectors* (1 black 1 white)
- 16 white ping pong balls
- 8 blue ping pong balls
- 1 POOF brand 4" orange, foam ball
<http://www.poof toys.com/toys/catalog/cat3/catalog.asp?action=catv&catid=40>
 (UPC 83568 02400) available at Wal-Mart
- 8 TP tubes (painted black)
- 1 4'x8' tile board
- 3/4" black electrical tape for corner zone, start box and lines
- 2 60W lamps
- Black, blue and green spray paint

*Note that different regions have large connectors available in different materials. The connectors used on the official gameboard will be made from PVC



Game Board Layout



Green baskets will be positioned symmetrically just before game start on a randomly chosen blue cross mark.

Game Board Setup

- The starting box is a 12" x 15" rectangle at the right hand corner of each end. It makes up a portion of the endzone
 - the starting box is 12" W x 12" H x 15"L
- The starting boxes and end zones are determined by the inside edges of the tape and the PVC pipe
- The center line of the field is not marked.
- The official board will have pencil marks for the corners of the nest and for each of the 8 TP tubes and PVC baskets. 3 balls will be in each TP tube, 2 white balls with a blue ball in between.
- All measurements on official boards will be as specified within +/- 1/4 inch. Deal with it.

Black Scoring Summary

	White Ping Pong Balls	Blue Ping Pong Balls	Tubes	Nest	Foam Ball
Black Basket	10	10	10	-----	30
Nest on black side	5	5	5	Nest points count for team whose side nest is on	-----
Black End Zone	0	0	5	5	10
Green basket on black side	-25	50	5	-----	50



White Scoring Summary

	White Ping Pong Balls	Blue Ping Pong Balls	Tubes	Nest	Foam Ball
White Basket	10	10	10	-----	30
Nest on white side	5	5	5	Nest points count for team whose side nest is on	-----
White End Zone	0	0	5	5	10
Green basket on white side	-25	50	5	-----	50



Game Rules & Scoring

- After "Hands-Off" and moments before the starting lights come on, the green baskets are placed symmetrically on the board on corresponding randomly selected locations.
- Each team scores points by:
 - placing ping pong balls in one of the scoring areas (matching color basket, green basket on their side, nest)
 - placing tubes in the nest, baskets, or end zone on their side
 - placing the foam ball in their end zone or their color basket or a green basket on their side of the board
 - green baskets only score points for the team whose side it is on at the end of the game



Scoring: Ping Pong Balls

- A. Ping Pong Balls count for 5 pts:
 - if their centers are within the vertical projection of the inside of the nest (and the nest is on your side)
- B. Ping Pong Balls count for 10 pts if their centers are contained within the raised basket located on that team's side of the board
- C. White Pong Balls count for negative 25 pts (this is a bad thing) if their centers are contained within the green basket and the basket is on that team's side of the board.
- D. Blue Pong balls count for 50 pts (this is a very good thing) if their centers are contained within the green basket and the basket is on that team's side of the board.



Scoring: Tubes

- A. Black tubes count for 10 pts if any part of them is contained within the volume of that team's raised basket.
- B. Tubes count for 5 pts if any part of them is
 - 1. Contained in the vertical projection of the inside of the nest (and the nest is on that team's side), or
 - 2. Contained in the vertical projection of that team's end zone, or
 - 3. Is contained in a green basket that is on that team's side of the board.
 - 4. Tubes that satisfy requirements for more than one of 1, 2, or 3 will be scored for only one category.



Scoring: PVC Nests

- A. The nest does not score points for any team.
- B. Ping pong balls and tubes that are in the nest score points for whichever side the majority of the nest is on at the end of the game.



Scoring: Foam Balls

- A. The foam ball scores 10pts if any part of it is over the vertical projection of a team's endzone. The points go to the team whose color matches that of the endzone.
- B. Foam Balls count for 30pts if any part of it is contained in the inside of a colored basket (black or white) and the points go to the team whose color matches that of the basket.
- C. Foam Balls count for 50pts if any part of the foam ball is contained within a green basket. The points go to the team on whose side the majority of the green basket lies.
- D. Foam Balls that satisfy requirements for more than one of A, B, or C will be scored for the one category that gives the most points.



Tie Breaking

Tie breaking (in order):

1. The team with the most green baskets on their side
2. The team with the highest ([blue balls in green basket] - [white balls in green basket])
3. Team with the most points in their colored basket
4. The team with the orange ball in scoring position
5. The team with the most ping pong balls on their side
6. The team who has a robot with a power switch closest to the nest.



Seeding/Performance Rounds

- S/P Rounds take place before the double elimination
- S/P rounds consist of best two out of three, unopposed rounds.
- All teams play Black-ball side
- Scoring = (black score) - (white score)
- Scores of less than -1 will be counted as -1
- Passing on a round gives a score of -1 for that round
- Seed Score = average of best two rounds



Double Elimination Tournament

- A team is out of the tournament when it has lost two games
- Initial matches are decided by seeding round
- Matches are arranged using KIPR tournament software
- Judges' decisions are final



Double Elimination

- A team's robot must have broken the border of the starting box sometime during the 90 seconds of game play (or have attempted to do so but been prevented by the other team's robots) in order to win that round. In other words, even if your opponent scores more points for your side than they do for their own, if your robots never break the bounds of your starting box during game play, you will lose the round. If a team has two robots, only one is required to break the bounds of the starting box.
- If neither team's robot's break the starting box bounds during game play, the round will be replayed once. If neither team moves out of the starting box during the replay, the round will be decided by coin flip.
- At least one robot from a team must be outfitted and programmed to respond to the starting light. A robot team that operates exclusively on a timer triggered by a hand operated switch is not allowed and will automatically cause that team to forfeit that round.



Tournament Logistics

- No part of any coach, mentor, teacher, etc, is allowed over the vertical projection of the outer edge of the pit area (with the exception of tournament staff)
- Once teams register for the tournament, the role of teachers, parents and mentors should be high-level coaching & cheerleading.
- Robots may only leave the pit to go to the game tables
- Teams will know their side assignment (black or white) at least 3 minutes before the match
- Up to 2 members from a team bring the robot to the tournament table and set it up



Tournament Logistics (2)

- Teams shake hands and visually inspect each other's robots before calibration.
- If either team wants to challenge the validity of the robots they are facing, they have to do it then.
- Inspection is limited to a max of 1 minute unless a specific challenge is made.
- Challenges have to be of the form:
 - That robot contains high explosives
 - That robot's hardened steel spike is designed to damage other robots.
- Judges will be the final arbiter.
 - Judges can dismiss what they believe to be spurious challenges
 - Teams found in violation will (unless the judge decides there have been extenuating circumstances) forfeit that round.
 - In no case will a robot that is determined before the beginning of the round to be in violation of the construction rules be allowed to play while in that state.



Tournament Logistics (3)

- The green baskets will be placed on the board for calibration purposes
- The starting lights (located directly behind the starting boxes) are on for calibration, then turned off for final calibration
- When both teams are ready or judges decide adequate time has been allowed for calibration, robots are activated and then -- Hands off!
- After Hands off, the **judges will place the green baskets in their final positions**
- After Hands off, no part of a team's robot(s) may leave the starting box until the starting lights turn on
 - If this happens, the judges will call a fault on the team
- If a team receives a 2nd fault in a round, they forfeit the round



Tournament Logistics (4)

- When the starting lights turn on the robots must autonomously start
- Lights will remain on for 5 seconds, turn off for 55 seconds and turn back on for the final 30 seconds of the round, flashing the last 5 seconds
- Once the starting lights have lit, the round counts unless a judge rules outside interference.



Tournament Logistics (5)

- Robots may NOT send reprogramming commands before, during or after a round.
- Teams cannot use infrared links to program their robots within 10 yards of the game board
- Teams may not broadcast ANY physical or electromagnetic signals to their robots once the teams are in "Hands-Off".
- Robots must cut power to their motors and turn off or stop issuing motion commands to servos by the end of the round or the judges may zero their score for that round (ties in this case are decided by the judge based on performance during the round)
- Scoring is based on the location of pieces at the end of the round, not how the pieces got there.
- Judges may at any time, while a robot is on the table, decide that a robot is in violation of construction rules, and then disqualify that robot for that round. Judges will not accept challenges to robots from the peanut gallery. Challenges must come from the judges or the teams at the table.



Tournament Logistics (6)

- Construction rules apply only to what is brought to the Game Table.
- There are no instant replays, we do not want to see videos of questionable decisions. If a team is unhappy with a judge's decision, they should challenge it then and there. Challenges to scoring after the teams have left the table, will not be considered.
- Teams cannot touch, borrow equipment, modify robots or computers, or beam commands to another team's stuff (including their pit table) without the permission and presence of a member of that team
- The security of a team's equipment is the responsibility of that team -- **don't leave valuables unattended.**



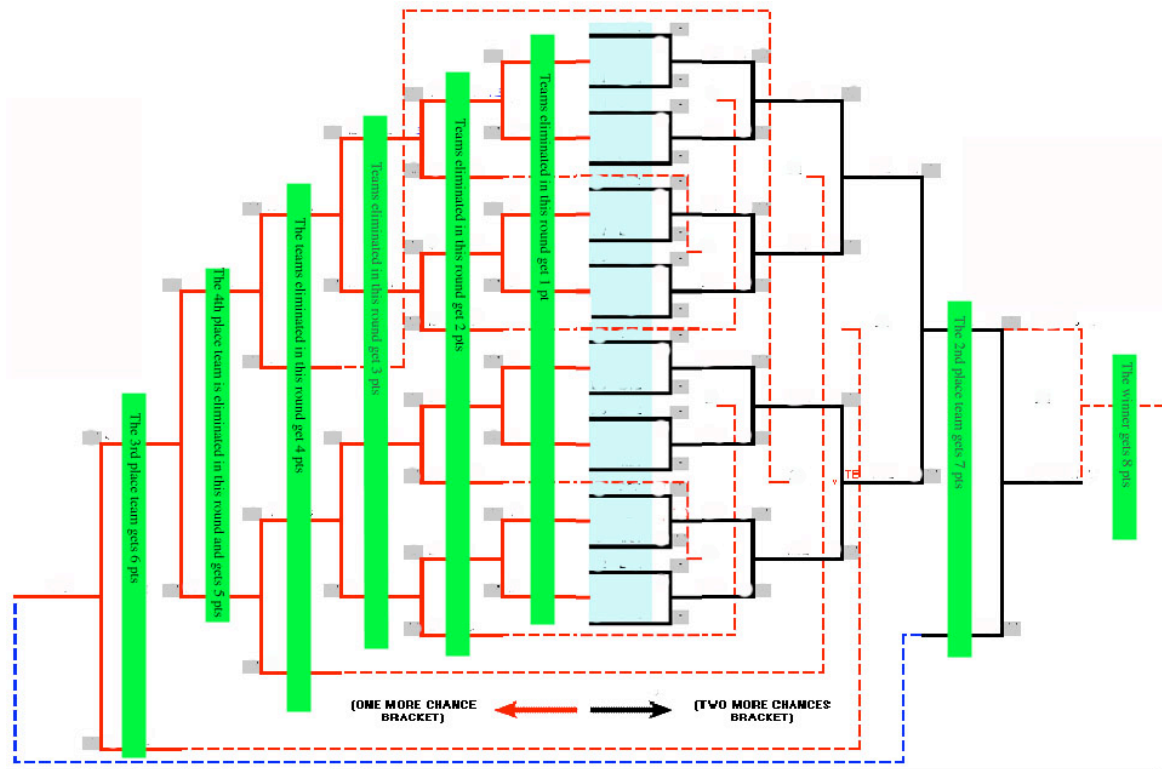
Winner

- Trophy winners will be selected by summing their points in each of the two contests (N= # of teams):
 - Seeding rounds:

$$\text{LOG}_2 (N/\text{rank}) + \text{LOG}_{10}(3 * (\text{seed_score} + 2))$$
 - Double elimination:
 winner gets: $2 * \text{Ceiling}(\text{LOG}_2 N)$
 (see next slide)



For $8 < N \leq 16$: Max score = $2\text{LOG}_2 16 = 8$



Regional Scoring Example

- Winning the double elimination does not guarantee winning the tournament
- In a 16 team contest, a team that wins the seeding with a score of 59 gets $(4 + 2.66 = 6.66\text{pts})$ and then finishes 7th or 8th in the double elimination (3pts) would have 9.66pts
- A team that finishes 9th in the seeding with a score of 15 $(.83 + 1.71 = 2.54\text{pts})$ and wins the double elimination (8pts) would have a total of 10.54pts

Team Membership

- Beyond Botball team members must be beyond High School in their educational careers
- College students, professional engineers, hobbyists, poets, and anyone else fulfilling the criteria above are all encouraged to participate



Things to do Before You Come to the Tournament...

- Test your robots from start to end:
 - Go through the entire starting sequence
 - Make sure you can calibrate to the starting light
 - Make sure the robots stop when they are supposed to: verify with a stop watch!
- **Does the starting sequence work with very bright overhead lights** (tournament tables will have bright lights hung about five feet above the tables) - **Test the shielding of your sensors!**



Check
www.botball.org
regularly
Good Luck!

