

Beyond Botball 2009 Rules & Game Review



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Kauai Economic Development Board



Beyond Botball Tournament

- The Beyond Botball Challenge & documentation is provided free by KIPR for educational use.
- Beyond Botball is designed as a project for a robotics, programming, systems or independent study class.
- The International Beyond Botball Tournament is held each year in conjunction with the Global Conference on Educational Robotics (GCER).
- Beyond Botball team entry forms and conference registration can be found at www.botball.org
- The 2009 Beyond Botball Tournament will be held in conjunction with GCER 2009 July 1-5, 2009 at the National Conference Center in Lansdowne, VA



Rules Update History

- v1.0: 12/11/08 Game rules first released



Robot Construction Rules

1. A team's entry (all materials placed on the game-board) must mass less than 10kg (22 pounds).
2. A team's entry (all materials placed on the game-board) must fit within the starting box. The starting box is 38cm by 61cm (15" by 24"). Starting boxes are 38cm high (15").
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; strategies likely to entangle or damage opponents or the board are not 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.



Robot Construction Rules (3)

10. Each robot must have a name suitable for broadcast over a PA system.
11. Team entries may NOT contain parts that may reasonably be confused with game pieces (entries may not contain colored poms, golf balls, etc)
12. A team's entry may be made out of any materials or parts (including Botball and non-Botball kits) as long as the entry conforms to the construction rules above.

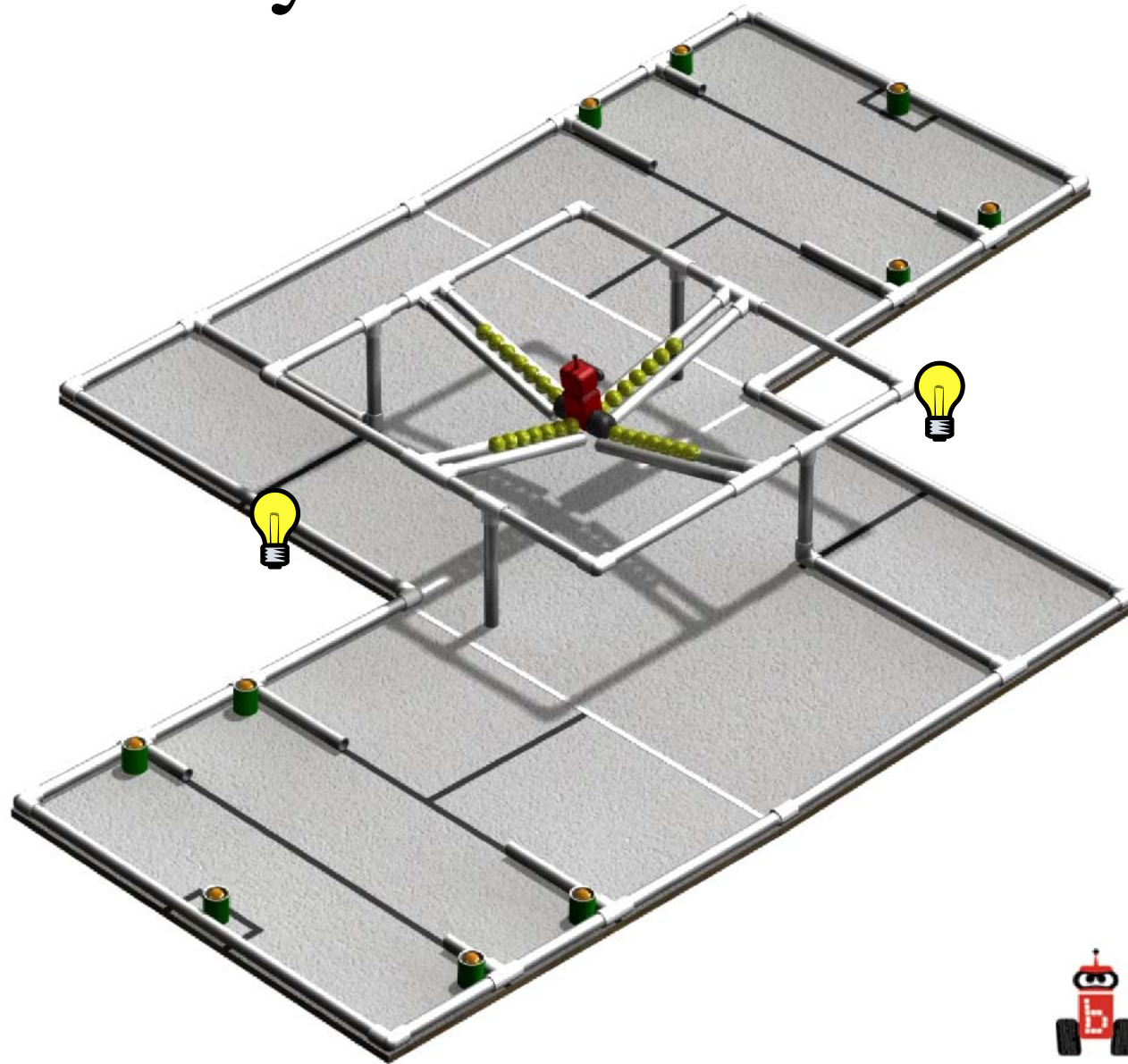


The Story

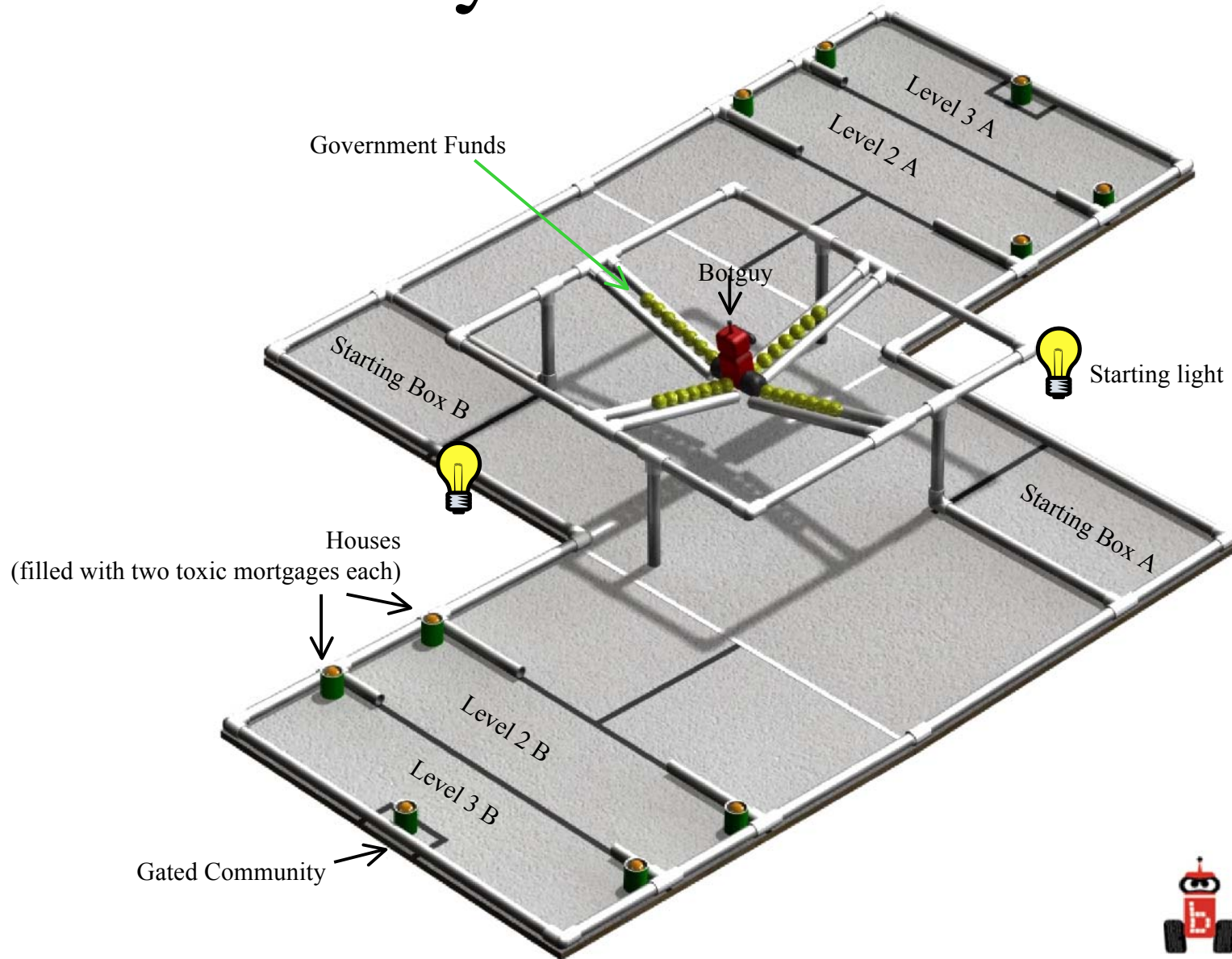
The real estate market is in crisis. Many homes appear to be built from toxic mortgage assets. While sound financing is available, it is difficult to get it into the right place. A huge amount of government resources have been made available to the towns of Robopolis and Botville, but government officials are trying to control the flood of funds. Your goal is to: a) release the flood of government assets, but make sure they are put where they can do the most good for your town; b) replace the toxic mortgages with sound financial instruments; and c) Get some new homes built in desirable neighborhoods, to get the economy of your town moving.



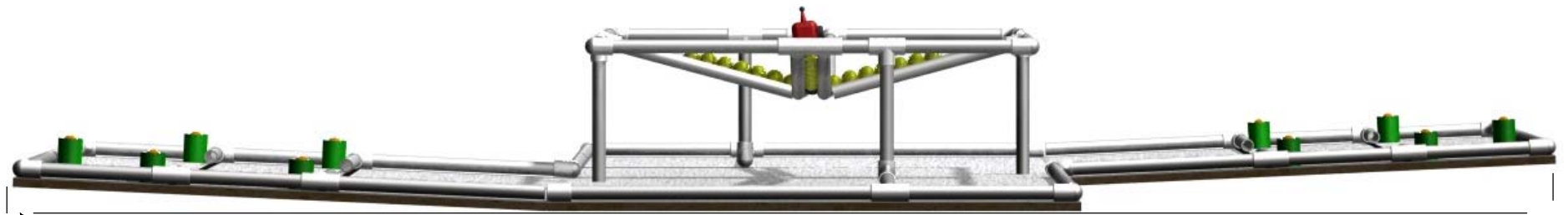
2009 Beyond Botball Board



2009 Beyond Botball Board



Board Shape



End is raised 3 inches (77mm) from floor

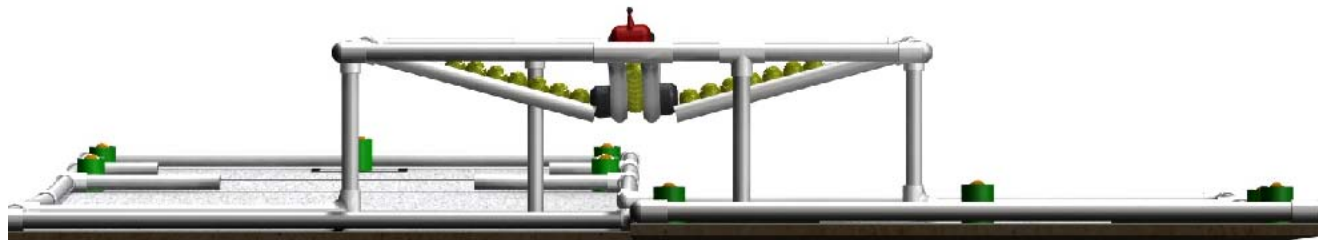


Table Structure

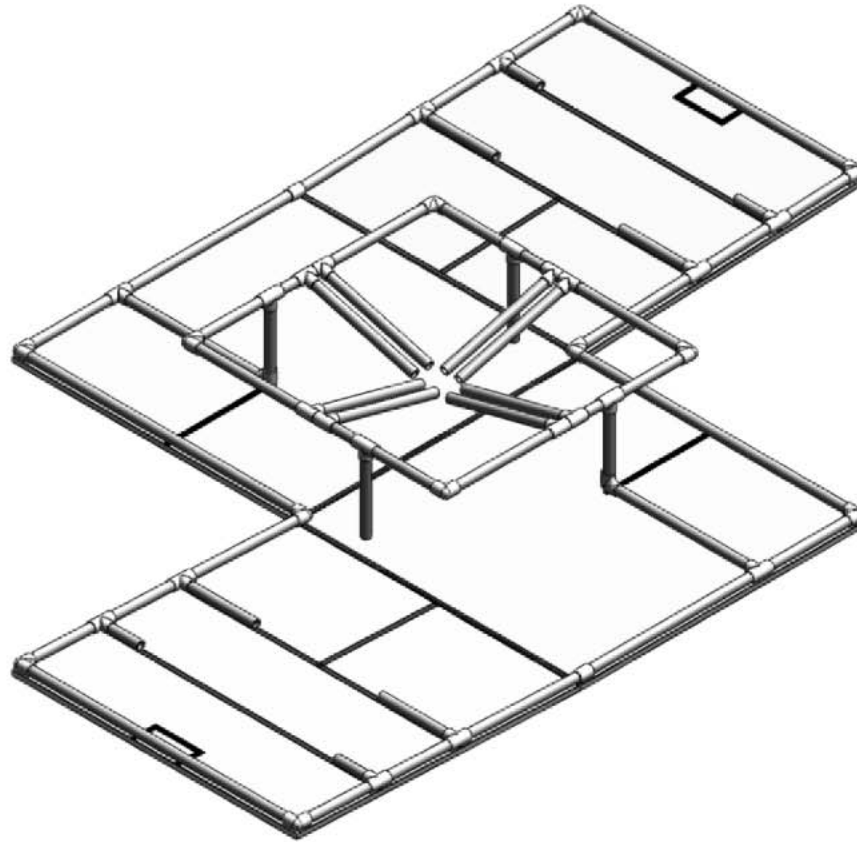
- 4 pieces of 4x4' MDF (122cm x 122cm)
- 4 pieces of 4x4' Fiberglass Reinforced Panels(122cm x 122cm)
 - Home Depot Store SKU# 121586
- 3 4' (122cm) FRP Divider
 - Home Depot Barcode # 070673858864
- Blocks to raise the two ends 3" (76mm)



Scoring Items

- 1 Botguy plush figure
- 20 Green 1.5" poms
- 28 optic yellow golf balls
 - <http://www.golfballs.com/PB1386-NYW/Optic-Tour-Distance-Yellow-Golf-Balls.html>
- 10 1.5" PVC couplers (2.7" tall, wrapped in Astrobrite green paper)





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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: Overview
		DIMENSIONS ARE IN INCHES	DRAWN			
		TOLERANCES:	CHECKED			
		FRACTIONAL ±	ENG APPR.			
		ANGULAR: MACH ± BEND ±	MFG APPR.			Q.A.
		TWO PLACE DECIMAL ±				COMMENTS:
		THREE PLACE DECIMAL ±				
		INTERPRET GEOMETRIC TOLERANCING PER:				
		MATERIAL				SIZE DWG. NO. REV
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	APPLICATION	DO NOT SCALE DRAWING				SCALE: 1:50 WEIGHT: SHEET 1 OF 7

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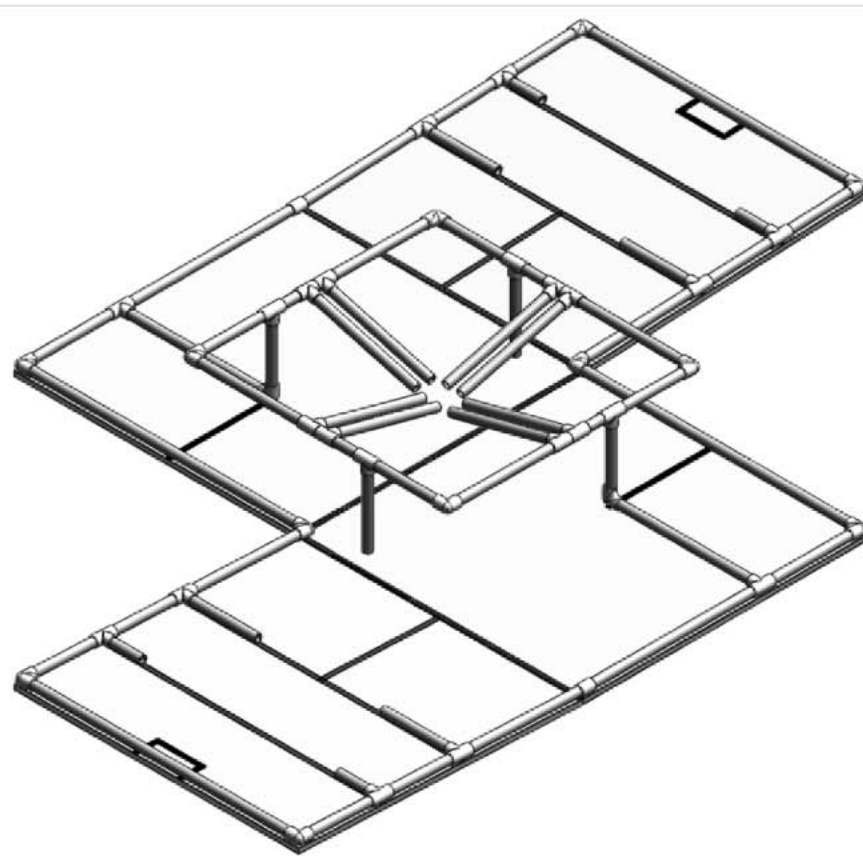
4

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ITEM NO.	PART NUMBER	QTY.
1	mdf	4
2	table surface	4
3	90 angle	14
4	T Connector	14
5	Coupler	2
6	46.5 inch pvc	2
7	15 inch pvc	2
8	24 inch pvc	2
9	29 inch pvc	2
11	45 inch pvc	2
12	12 inch pvc	16
13	19.5 inch pvc	4
16	6 inch pvc	4
18	Surface connector	3
19	19 inch pvc	2
20	18.5 inch pvc	8
21	4.5 inch pvc	2
22	5.5 inch pvc	2
23	T Connector-modified	8
24	17.5 inch pvc	2
25	1 inch pvc	4
26	11 inch pvc	2
27	12.5 inch pvc	2
28	3/4" wide PVC tape	1 Roll



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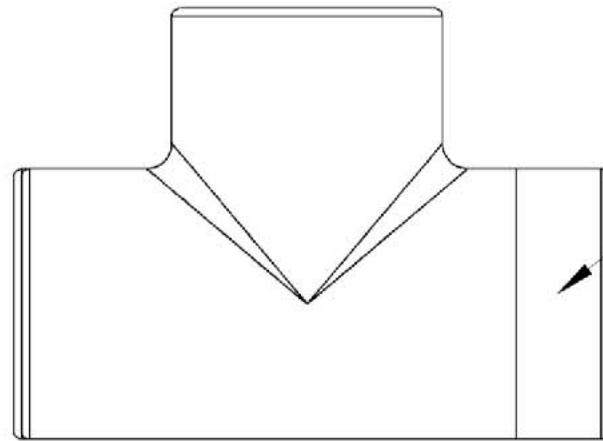
Bill of Materials

SIZE DWG. NO. REV

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SCALE: 1:50 WEIGHT: SHEET 2 OF 7





0.50" removed by cutting or sanding

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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	TITLE: Modified T Connector
		DIMENSIONS ARE IN INCHES	DRAWN		
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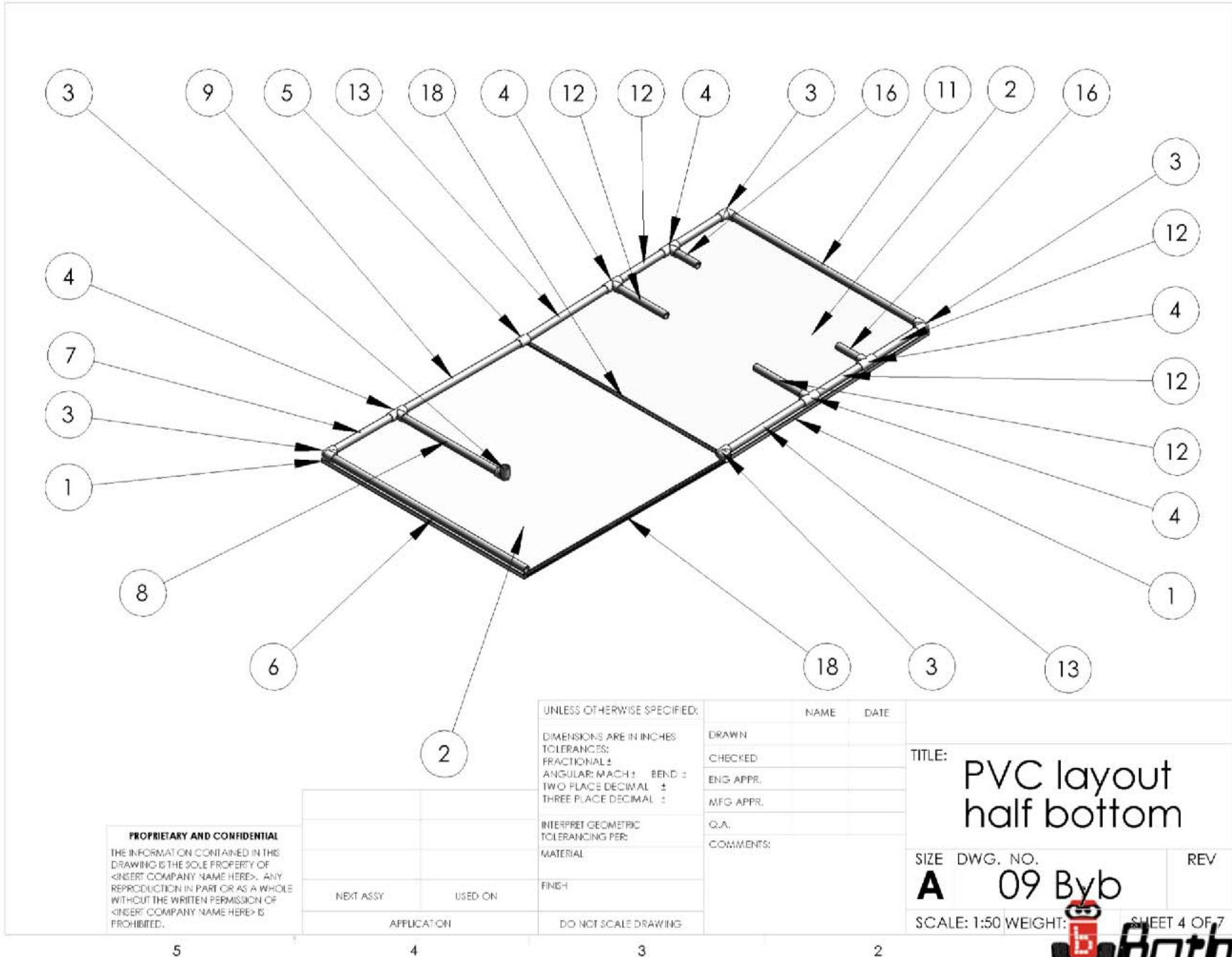
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APPLICATION	USED ON

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 ANGULAR: MACH ± BEND ±
 TWO PLACE DECIMAL ±
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 MATERIAL
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 DO NOT SCALE DRAWING

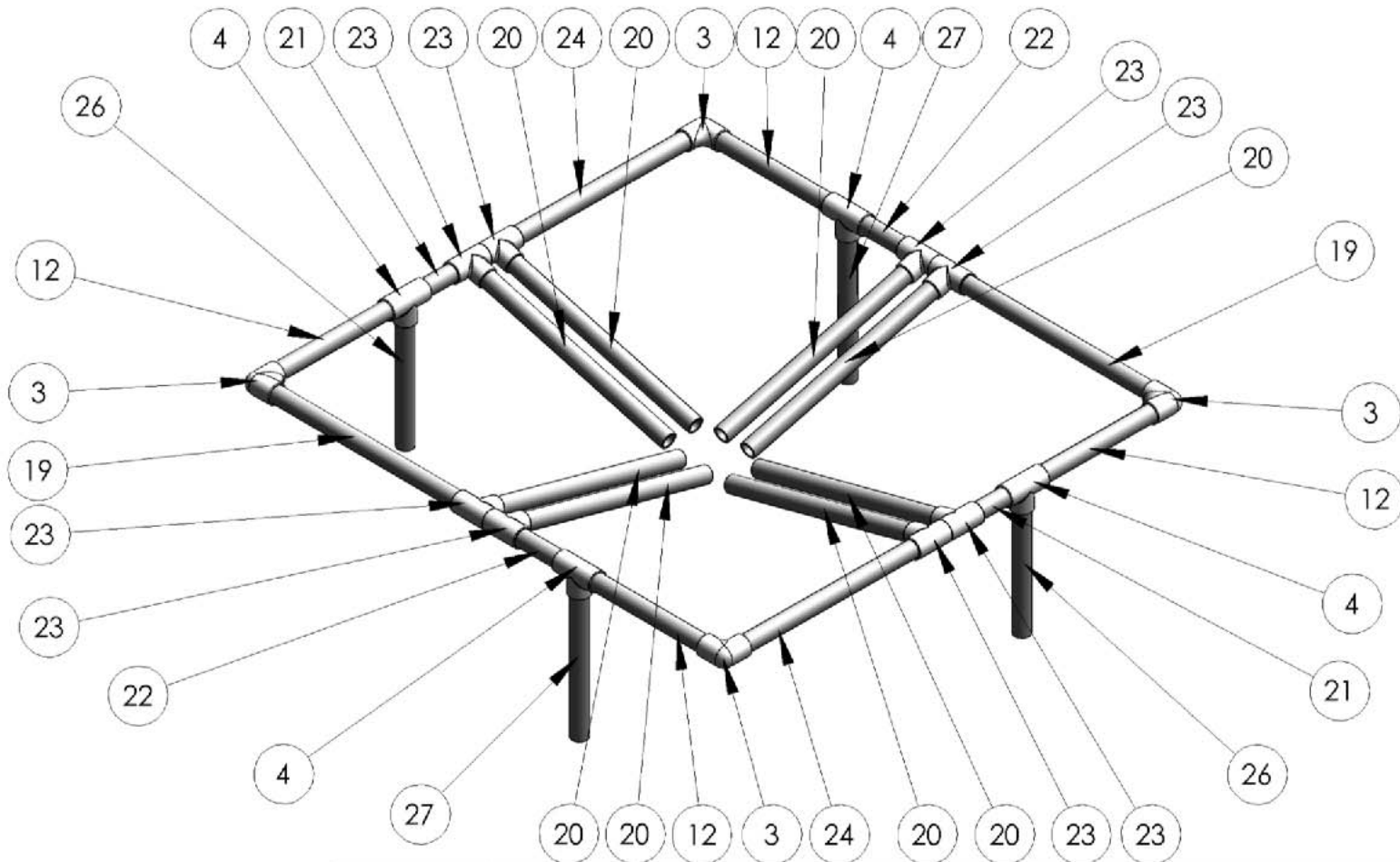
NAME	DATE

TITLE: **PVC layout half bottom**

SIZE	DWG. NO.	REV
A	09 Byb	
SCALE: 1:50	WEIGHT:	SHEET 4 OF 7



5 4 3 2



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE
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		TWO PLACE DECIMAL ±	Q.A.	
		THREE PLACE DECIMAL ±	COMMENTS:	
		INTERPRET GEOMETRIC TOLERANCING PER:		
		MATERIAL		
		FINISH		
NEXT ASSY	USED ON			
		DO NOT SCALE DRAWING		

TITLE: **Top PVC layout**

SIZE DWG. NO. REV

A 09 Byb

SCALE: 1:50 WEIGHT: SHEET 5 OF 7

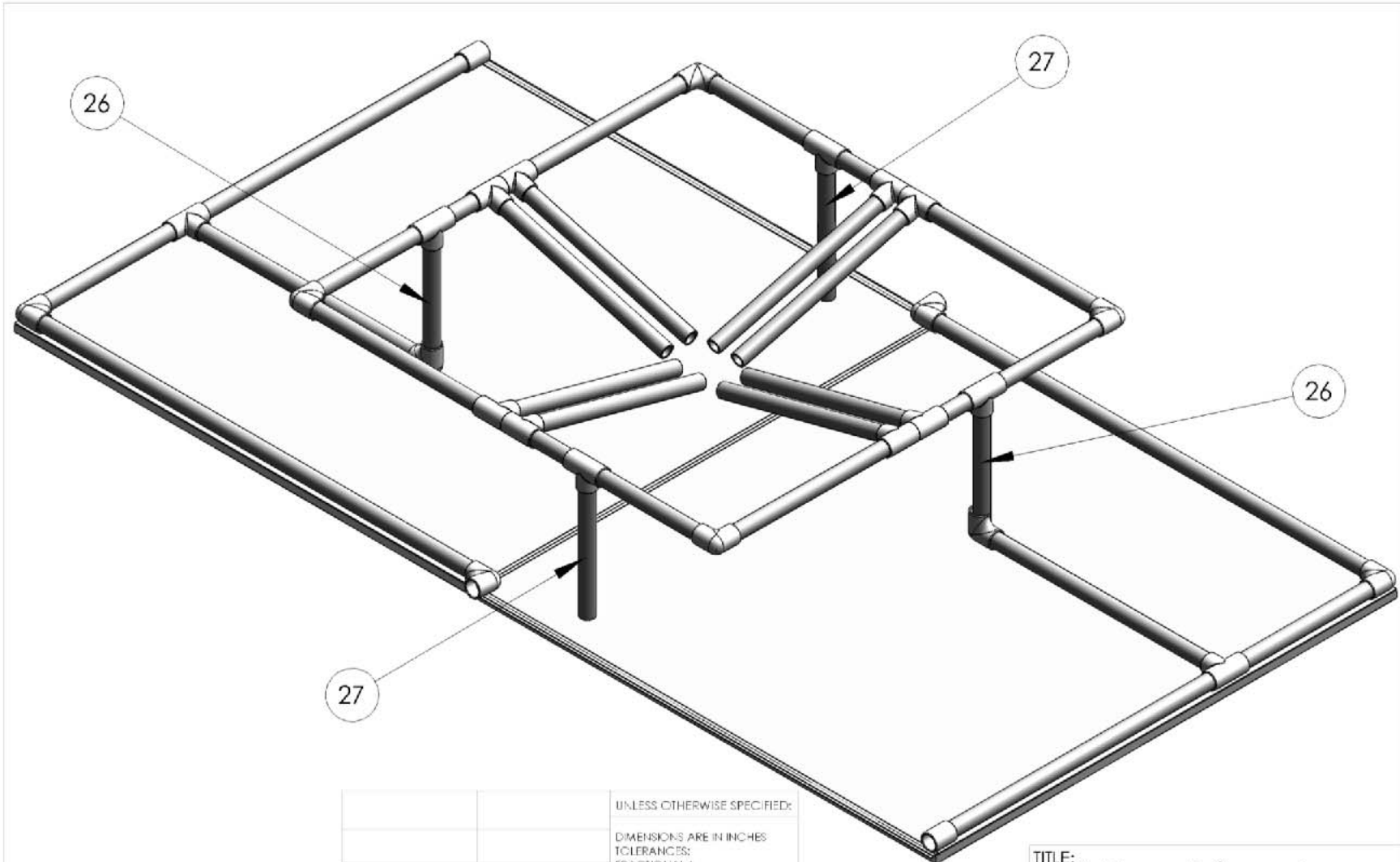
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		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	ENG. APPR.
		INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL	Q.A.
		FINISH	COMMENTS:
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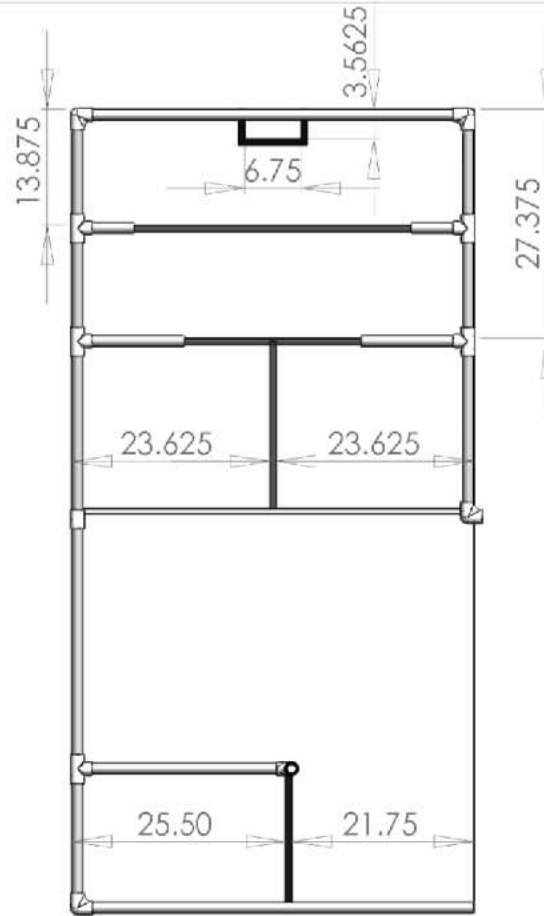
TITLE: **Attaching top to bottom**

SIZE DWG. NO. REV
A 09 Byb

SCALE: 1:50 WEIGHT: SHEET 6 OF 7

5 4 3 2





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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	TITLE: Tape Layout
		DIMENSIONS ARE IN INCHES	DRAWN		
		TOLERANCES:	CHECKED		
		FRACTIONAL ±	ENG. APPR.		
		ANGULAR: MACH ± BEND ±	MFG APPR.		SIZE DWG. NO.
		TWO PLACE DECIMAL ±	Q.A.		A 09 Byb
		THREE PLACE DECIMAL ±	COMMENTS:		REV
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			SCALE: 1:50 WEIGHT: SHEET 7 OF 7

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Game Board Setup

- A team's entry must fit completely within their starting boxes.
- The starting boxes have a virtual height of 15" (38cm).
- Note that the infrastructure used to distribute the government funds have an outer clearance of approximately 14" (35.5cm) and a central clearance of approximately 10" (25.5cm). The central clearance height may vary as funds are distributed.
- Botguy is positioned so as to keep the funding in place. If he is removed the funds will be randomly distributed all over the board.
- The lower ends of the four distribution channels may have slightly different heights for the left and right sides (left side being up to an inch lower) in order to facilitate the distribution of funds.
- Each house starts with two toxic mortgages inside.
- All measurements on official boards, whose uncertainty is not otherwise specified will be as specified within +/- 1/2 inch (12mm) or 1%, whichever is greater. Deal with it.



Scoring Summary

	Your starting box	Your Level 2	Your Level 3	Gated Community
Toxic Mortgage (orange pom) (20)	2	-1	-2	-3
House (green coupler) (10)		2	3	6
Government Funds (golf ball) (28)		2	4	6
Government Funds Inside a House (max 20 of 28)		4	8	12
BotGuy (1)		X2	X3	X3

Max possible score: 1164.



Team Identification

- A team's scoring area is on the hill to the right of their starting box (when in the box and facing the open end)
- The starting boxes are arbitrarily labeled A or B to facilitate tournament logistics



Scoring: Houses

- A. There are five houses on each side
- B. Houses may be moved by the robots to any location on the board
- C. The houses score if any part of them is touching the game surface on the uphill edge of the tape that denotes the scoring area
- D. Houses score in the highest point area for which they qualify
- E. The gated community is marked by the inside edge of the taped rectangle at the top of the hill
- F. Houses may score if they are on their side, but the part touching the surface must be in the scoring area.
- G. Houses stacked on top of other houses do not score (we are only interested in funding single family houses, not duplexes or apartment buildings)



Scoring: Poms

- A. There are 20 orange poms (toxic mortgages)
- B. They start, two each, inside the houses
- C. Poms may be moved by the robots to any location on the board
- D. A pom is in a scoring area if any part of the pom is in the positive vertical projection of that scoring area (note that the positive vertical projection is orthogonal to the game surface)
- E. The scoring areas are based on the uphill or inside edges of tape and PVC
- F. Poms on the hill score in the most negative area for which they qualify
- G. Poms in the starting box score positively if any part of them is in the scoring area



Scoring: Botguys

- A. There is 1 Botguy
- B. Botguy does not have any intrinsic point score
- C. Botguy may be moved by the robots to any location on the board
- D. If Botguy is on your hill, it may act as score multiplier
- E. If any part of Botguy is within the positive vertical projection (orthogonal to the game surface) of Level 2 or Level 3 (as defined by the uphill edge of the tape and PVC) then Botguy will act as multiplier based on its highest scoring area for which it qualifies
- F. If Botguy is in Level 2, then that team's total score is doubles
- G. If Botguy is in Level 3 (including the gated community) then that team's score is tripled



Scoring: Government Funds

- A. There are 28 units of government funding (golf balls)
- B. Government funds may be moved by the robots to any location on the board
- C. The Government funds score if any part of them is touching the game surface on the uphill edge of the tape or PVC that denotes the scoring area
- D. Government funds score in the highest point area for which they qualify
- E. The gated community is marked by the inside edge of the taped rectangle at the top of the hill
- F. Government funds only score if they are touching the game surface in a scoring area, or if the center of the fund is contained within the volume of a house that is in scoring position (the fund then scores in the same areas as the house)



Tie Breaking

Tie breaking (in order):

1. The team with the highest scoring gated community
2. The team with the fewest toxic mortgages on their hill in scoring position
3. The team with the most government funds located inside houses anywhere on their hill
4. The team with Botguy anywhere on their hill
5. The team with the most government funds located anywhere on their hill
6. Team with their robot's motor power switch closest to their gated community



Seeding/Performance Rounds

- S/P Rounds take place before the double elimination
- S/P rounds consist of best two out of three, unopposed rounds.
- Scoring = (your points) - (their points)
- Scores of less than -1 will be counted as -1
- Teams that never break the bounds of the starting box during a seeding round, or who take a pass on a seeding round will score -1 for that round
- Teams found in construction violations that could effect performance or safety will be, at the judge's discretion, required to modify their robots or forfeit the 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 180 seconds of game play or they will forfeit that round. If a team has more than one robot, only one is required to break the bounds of the starting box.
- Robots must stop all motors and other actuators at the end of the round. Failure to do so will result in loss of round (unless the other team never broke the starting box).
- If neither team's robots 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 (1)

1. Teams shake hands and visually inspect each other's robots before calibration.
2. If either team wants to challenge the validity of the robots they are facing, they have to do it then.
3. Inspection is limited to a max of 1 minute unless a specific challenge is made.
4. Challenges have to be of the form:
 1. That robot contains high explosives
 2. That robot's hardened steel spike is designed to damage other robots.
5. Judges will be the final arbiter.
 1. Judges can dismiss what they believe to be spurious challenges
 2. Teams found in construction violations that could effect performance or safety will be, at the judge's discretion, required to modify their robots or forfeit the round.



Tournament Logistics (2)

1. Teams will set up their robots, performing any necessary calibrations. Setup time should be two minutes or less.
2. When both teams are ready or judges decide adequate time has been allowed for calibration, robots are activated and then -- Hands off!
3. 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
4. If a team receives a 2nd fault in a round, they forfeit the round



Tournament Logistics (3)

1. After teams are set up and robots are awaiting the starting lights
2. When the starting lights turn on the robots must autonomously start
3. Lights will remain on for 5 seconds, turn off for 170 seconds, and flash the last 5 seconds
4. Once the starting lights have lit, the round counts unless a judge rules outside interference



Tournament Logistics (4)

1. Teams cannot use infrared links to program their robots within 10 yards of the game board
2. Teams may not broadcast ANY physical or electromagnetic signals to their robots once the teams are in “Hands-Off”
3. Robots must cut power to their motors and turn off or stop issuing motion commands to servos by the end of the round or risk forfeiting the round
4. Scoring is based on the location of pieces at the end of the round, not how the pieces got there.



Tournament Logistics (5)

1. Construction rules apply only to what is brought to the Game Table
2. 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
3. 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

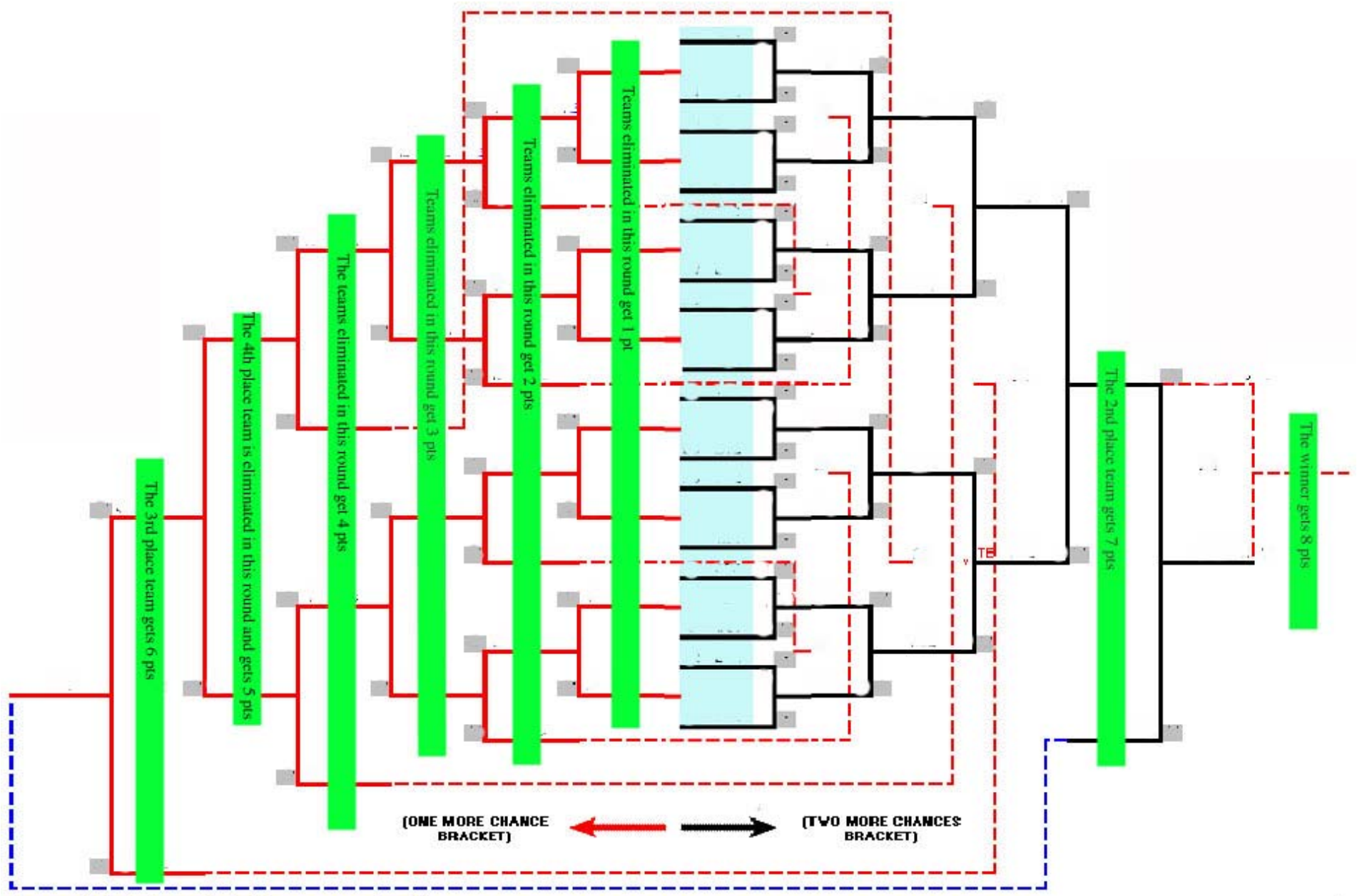


Winner

- 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 = $2\text{LOG}_2 16 = 8$



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 ($4+2.66=6.66$ 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 ($.83+1.71=2.54$ pts) and wins the double elimination (8pts) would have a total of 10.54pts



Team Membership

- At least one Beyond Botball team member 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!

