

# BunnyBots 2015 Rules

## ***Danger Zone***

Version 1.2 - 9/22/15

BunnyBots is an annual pre-season event designed by Catlin Gabel School FRC Team 1540, the Flaming Chickens. Its purpose is to give new FRC students and teams a chance to get familiar with robot construction before the build season starts while giving veterans the opportunity to try new things and lead. This game is more relaxed than the FRC competitions and all in good fun.

### **WHO'S INVITED**

Team 1540 hosts a competition for PNW teams. This is, however, designed to be an easy event to stage so teams in other regions are more than welcome to host one of their own. Let Dale Yocum (yocumd@catlin.edu) of Team 1540 know if you are interested in doing this so we can share logistical details.

### **REGISTRATION**

Registration for BunnyBots 2015 requires a \$100 per robot fee. We'll waive the fee if this is a hardship. Register at [www.team1540.org/BunnyBots](http://www.team1540.org/BunnyBots). Space is limited so it's first come first served. Your space is not held until registration fees have been received or waived.

You can register online at [www.team1540.org/bunnybots](http://www.team1540.org/bunnybots). You'd then send a check to:

Dale Yocum

Catlin Gabel School

8825 SW Barnes Rd.

Portland, OR 97225

Please include your team number either on or with the check!

Revision History (changes since last edition in red)

*This is a living document. The recent rule modifications or edits will be noted here*

9/1/15 v1.00 Initial Release

9/9/15 V1.1 Rules updated to restrict robot's ability to damage game pieces. *"R16: Robots may not damage game pieces in consistent ways as a function of their design. During robot inspection, teams with suspect mechanisms will need to demonstrate to the inspector that the balls won't be damaged significantly. Referees will require robots that consistently damage balls to be re-inspected. Robots must pass inspection in order to play."*

9/22/15 V1.2 *G7: If a football exits the field, ball retrievers not affiliated with the teams playing will give the ball to the nearest human player. If that player already has a ball in their grabber they'll give it to the other human player on the same alliance. If both human players already have a ball in their grabber then the ball retriever will gently throw the ball back on the field. Human players re-introduce balls into play with their grabbers. Balls can not rest outside of the field for longer than it takes to be retrieved. They must be in the grabber of human players or inside the field boundary. This is to prevent ball hoarding strategies.*

*P9: No high speed ramming is allowed in the home and end zones. Yellow and Red cards at the referee's discretion.*

*P17: Robots intentionally possessing more than two footballs will receive a red card. This was included before but is now also in the penalties section.*

## GAME SUMMARY

Danger Zone is played by two alliances of three robots each. After a 10 second autonomous period, the 2:20 teleoperation period begins. During teleop, robots attempt to score as many touchdowns as possible by transporting foam footballs the length of the field to the alliance's end zone. Additional points are awarded depending on how the scoring robot acquired the ball. Additionally, three stuffed bunnies start off in each alliance's home zone. Bunnies score 10 points each in each alliance's end zone at the end of the match.

## GAME DETAILS

As seen on Fig. 1, three robots form an alliance against three other robots on a full size 27' x 54' field. The field surface is standard industrial carpet identical to that used at FIRST competitions. This game is played with foam footballs <http://amzn.com/B0042H2O3I>.

For the remainder of this document, we'll use the term "game piece" to refer to footballs or bunnies.

1. Four footballs start off the match touching the carpet in each alliance's home zone (the zone closest to the drivers) and not in contact with a robot.
2. A football's journey across the field must originate in the alliance's home zone to score. A ball must contact the carpet in this home zone before it becomes live. If the ball contacts the carpet outside of the home zone it becomes dead and can not score. The only way to make the ball live again is for it to contact the carpet in the alliance's home zone.
3. Human players (one per team) stand on the sides of the field anywhere on their alliance's half of the field (closest to their drivers) and can move or pick up footballs within the home zone. Finally human players can retrieve footballs that have gone outside of the field boundary. When performing any action involving footballs, human players must use the grabbers <http://amzn.com/B0000V0AGS> provided at the competition. Human players (or their grabbers) cannot:
  1. Touch bunnies inside or outside of the field.
  2. Touch footballs outside of the home zone unless the game piece is outside of the field boundary.
  3. Intentionally cause game pieces to exit the field not under the control of a robot (accidental movement is fine.)
  4. Touch the carpet within the boundary of the field with any part of their body.
  5. Touch game pieces with their bodies (they must use a grabber.)
  6. Intentionally contact robots in any way.

4. Each football contacting an alliance's end zone (at the opposite end of the field from their drivers) is worth a varying number of points depending on how the scoring robot acquired the ball. To score, the football must be clearly out of the control of the scoring robot (in the referee's opinion) and must contact some portion of the carpet in the end zone.

4 points if a human player transferred it to a robot in contact with the home zone.

10 points if the robot loaded the football (which is in contact with the home zone) itself from the ground while in contact with its home zone. The human player or their grabber can not be involved in helping to feed the ball into the robot other than placing it in a convenient location. The ball will be counted as human loaded if this is noted.

20 points total if the ball was passed from another robot without touching the carpet. Both robots must be outside of their home zone for this pass to be valid. The ball will become dead if either robot is in contact with their home zone or if the ball was already dead when passed.

5. Robots can only be in possession of one ball at a time. Possession is defined as controlling the ball such that the ball consistently moves with the robot. The referees and inspectors are the final arbiter of what constitutes possession. If a robot is in possession of more than one ball, all of those balls go dead. They'll need to touch the carpet in the home zone to become live again. Incidental, momentary multiple possession won't be called. Intentionally possessing more than two balls will earn a red card. This is to defeat chokehold strategies.
6. Each alliance selects 3 stuffed bunnies 9"-12" high at the beginning of the match. Teams must place these somewhere in the alliance's home zone to be picked up or moved exclusively by robots before the match starts. Human players can't contact bunnies. Bunnies cannot be in contact with a robot when the game begins. At the end of the match, 10 points are awarded for each bunny resting with some portion in contact with the alliance's end zone carpet and not in contact with a robot from the scoring alliance. Bunnies are not associated with a particular alliance so there is no rule against stealing an opposing alliance's bunny. Note that you will want to do something with these bunnies as 10 points are awarded to your opponents for every bunny left in your home zone! Robots can only possess one bunny at a time.
7. If a football exits the field, ball retrievers not affiliated with the teams playing will give the ball to the nearest human player. If that player already has a ball in their grabber it will be given to the other human player on the same alliance. If both human players already have a ball in their grabbers then the ball retriever will gently throw the ball back on the field. Human players will re-introduce it into play with their grabbers. Balls can not rest outside of the field for longer than it takes to be retrieved. They must be in the grabber of

human players or inside the field boundary.

8. A ball can only be introduced within a team's home zone by the human player using their grabber.
9. Bunnies cannot be reintroduced to the field should they go outside of the field boundary.
10. There is no rule preventing a robot from stealing a ball or bunny from the opposing alliance's home zone.

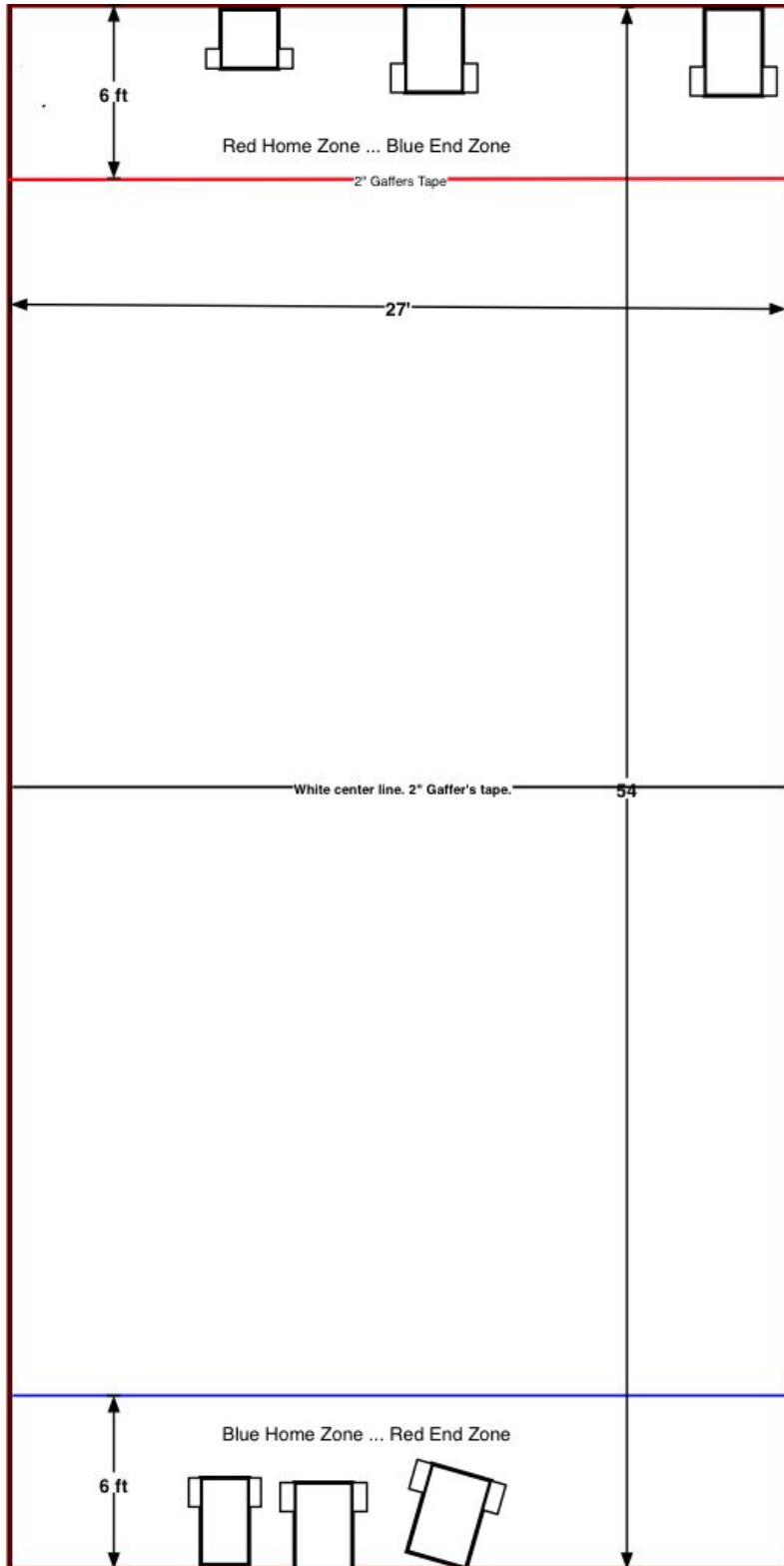


Fig 1. Field Diagram

## **AUTONOMOUS PERIOD**

Robots must begin the autonomous period with some portion of the robot touching the 4x4 wall nearest their operators.

During autonomous period, teams may try to cross the center line of the field to score 15 points for their alliance. Wise teams will keep in mind that both alliances share a center line, and as a result, robot-to-robot contact is likely during autonomous.

Robots are also free to take any other legal action during the autonomous period. No human interaction is allowed with robots or scoring objects during the 10-second autonomous period. "Autonomous" systems assisted by humans using laptop cameras, IR remote controls, voice, Xbox Kinect, etc. are forbidden.

## **BALL STATUS**

Balls can be either live or dead. A dead ball isn't worth points when scored, whereas a live ball is. A ball becomes live when it touches the carpet within the alliance's home zone past the red or blue tape. A ball becomes dead if any of the following occur:

- a. It contacts the carpet outside of the alliance's home zone.
- b. The robot in possession of the ball is also in possession of another ball. All of the robot's balls become dead in this case.
- c. The ball goes out of bounds.
- d. When a ball is scored in an end zone, it becomes dead for the scoring alliance. It also, however, becomes live for the opposing alliance. Should the ball subsequently roll out of the home zone that alliance would need to return it to contact their home zone's carpet for it to become live again.

## **ROBOT RULES**

All FRC robot rules (that aren't game specific) from **2014** apply with the following modifications:

1. Since the whole point of BunnyBots is to get new team members up to speed, robots should be built from scratch for the event, just like FRC. You can't use last year's FRC robot or BunnyBot with a few tweaks.
2. There are no limits on the number of motors on a robot, but they must have been legal in FRC at some point within the last five years. In addition you may use any 300, 500, or 700 series motor and any motor sold by AndyMark, VEXPro, or Banebots.
3. Unlike previous BunnyBots games, bumpers are required. Bumpers must be constructed generally along FRC techniques. The bottom of the bumpers must be at least .5" off the ground and the top no more than 8.5" off the ground. At least 75% of the robot's

perimeter must be protected by a bumper. Avoid blue or red bumpers if possible as teams may confuse that for your alliance color. Alliances are indicated by flags in BunnyBots.

4. Robots in their starting configuration, excluding their bumpers, must not exceed a 112" perimeter with a maximum height of 60". Once the match has started, robots may extend no more than 14" outside of those dimensions in any direction. Robots who exceed this will incur a warning and then a red card.
5. Robots may not intentionally detach pieces of themselves. Accidentally having parts fall off is fine.
6. The maximum weight of a robot, without its battery, is 120 lbs excluding bumpers.
7. FIRST electrical rules don't apply. This allows you to use any control system you like, such as the cRIO controller, VEX controllers, RC controllers, infrared, roboRIO, etc. Use common sense and follow FIRST wiring guidelines when possible. Make sure your radio system doesn't interfere with 5Ghz FRC radios if you are using something different.
8. Do not use anything that relies on normal WiFi 802.11b/g to control your robot as experience has shown that to be unreliable. If you are using the 2009-2014 or the 2015 FRC control system, be sure you are using the 5GHz WiFi band because radio interference in the 2.4GHz band makes for very unreliable driving. Note: the standard Classmate laptop does NOT support the 5GHz band. Either use a laptop that has dual band N wireless or a separate dual band N network adapter. The TRENDnet TEW-684UB is one option for a dual-band N network adapter that has worked in the past. Note that all of this must be battery powered. While there will hopefully be AC power at the driver's stations, you'll want to be connected to your robot before arriving. This is so teams can sync their robots and laptops while in queue, which dramatically speeds up matches. In the interest of time, we will not hold the match for you.
9. There is no limit to the equipment used in the driver station though it must all be battery powered and quick to set up.
10. There is no cost accounting for BunnyBots, but common sense would say you don't want to spend too much money for BunnyBot parts you can't use again.
11. Any part that was legal for any previous FRC competition may be used.
12. There is no requirement that parts used on your BunnyBot be available off the shelf. This allows you to use random parts you might have lying around the shop or that have been removed from other devices. The idea is for people to not spend too much money on this.
13. The power source for BunnyBots is a single FRC-legal 18Ah battery.



14. Each robot must have a place to insert a flag that identifies their alliance color. The shaft for these flags (provided at the competition) is 5/16" in diameter with flag shafts about 3' high.
15. Each robot must display its team number in 4" or higher characters of a contrasting color on at least two opposing sides; more sides are preferable. Numbers don't have to be on bumpers, but it's an option. The robot will be announced in the form "Team 1234" by the announcer. If the robot has a name, it may be announced if it's on the robot. If a given FRC team has more than one BunnyBot, they should be labeled 1234 followed by a single letter. 1234B, for example, could be announced as 1234 "Bravo" or 1234 "Bogus". It's up to you. Including your school's name and sponsors on the robot would be good marketing and helps the MC but is not required. The scoring system will be expecting the single letter suffix for teams with multiple robots, so don't get creative with the numbering.
16. Robots may not damage game pieces in consistent ways as a function of their design. During robot inspection, teams with suspect mechanisms will need to demonstrate to the inspector that the balls won't be damaged significantly. Referees will require robots that consistently damage balls to be re-inspected. Robots must pass inspection in order to play.

## **PENALTIES AND RED CARDS**

1. A 20 point penalty is assessed for a robot that goes out of bounds (over the 4x4s). You are considered out of bounds if any portion of your robot touches the floor beyond the 4x4s. Once a robot is out of bounds, it must be disabled, manually returned to the playing field, and re-enabled. Wise robot designers will make sure some portion of the robot or bumper contacts the 4x4s before its wheels do.
2. Intentional incursions into an opposing alliance's robot's starting frame perimeter will incur a 20 point penalty per incident. Intentional frame incursion with the obvious intent to cause harm to opposing robots will incur a red card.
3. Human players will incur a 20 point penalty per incident for directly and intentionally causing a football to exit the alliance's home zone (the area at or above the home zone carpet) not under control of a robot.
4. Human players may not contact a bunny. A 20 point penalty is assessed per incident should this happen intentionally.
5. Human players will incur a penalty for going past the extended field center line into the opposing alliance's half of the field. This can range from a warning, to a 20 point penalty, to a red card at the referee's discretion.

6. A 20 point penalty will be assessed if the human player or their grabber intentionally contacts a football that is not in contact with their home zone. This doesn't apply to game elements outside of the field boundary.
7. A 20 point penalty will be assessed against an alliance should their human players contact a football with something other than a grabber anywhere during the match. Therefore, be careful when picking up balls that have left the field or getting them from the ball retrievers.
8. A 20 point penalty will be assessed per incident for a human player intentionally contacting a robot with their grabber. This could escalate to a red card at the discretion of the referees for intentionally interfering with opposing robots.
9. This BunnyBots game is a contact sport, and as such, there is no penalty for high-speed ramming outside of the home/end zones. Robots should be designed robustly with this in mind, and this is why bumpers are required this year. Yellow/Red cards are issued for high speed ramming in the home/end zones. Gracious Professionalism and Coopertition should be kept in mind at all times. This isn't BattleBots. See #10 below.
10. Ungracious behavior will not be tolerated. Penalties are up to the referees and can range from a warning to 20 point penalties to red cards.
11. Teams should keep in mind that spectators will be standing close of the field. Robots employing strategies that might harm people will be disqualified.
12. If the opposing alliance performs an action that causes a team to violate the rules, no penalty will be assessed. This is up to the referees and is judged on a case-by-case basis.
13. An alliance may not pin an opposing robot that is in contact with a field border or another robot for more than 5 seconds. A robot will be considered pinned until the robots have separated by at least 6 feet. The pinning robots must then wait for at least 3 seconds before attempting to pin the same robot again. Violation: 20 points initially and 20 points for every five seconds thereafter.
14. A 20 point penalty will be assessed on two or more robots working in unison to defend a robot of the opposing alliance for more than five seconds. This penalty will repeat for every five seconds the behavior continues.
15. Robots will accrue a 20 point penalty for staying in their alliance's end zone for more than 10 consecutive seconds. Another 20 points will be assessed for every 10 seconds thereafter if the robot does not leave. (This rule is intended to prevent teams from guarding the opposing alliance's home zone and slowing the game down. If this appears as a repeated strategy, the 20 point value may increase.)

16. A 20 point penalty will be assessed for robots possessing more than more bunny at a time. Momentarily possessing more than one bunny, for example during collection, will not be called.

17. Robots intentionally possessing more than two footballs will receive a red card.

## QUEUES

When a team is ready to play, they get in the queue. Teams are on their honor that when they are in the queue, their robot is functional. Teams may not do more than trivial repairs to their robots while they are in the queue and can't use power tools. Of course, the more matches you play, the higher your qualification score. Building a reliable robot is critical.

A robot is not in queue unless the robot, the driver's station, and at least two team members are present. You can't save a space in line.

Each team will have a pit area in the adjacent building next to the arena. This is where robots go for most repairs. They are not in the queue while in the pit area nor will queue staff go looking for them there. It's the responsibility of the team to get in queue every time they are ready to play a match.

## QUALIFICATION POINTS AND FINAL MATCHES

After playing a match teams earn qualifications points using the formulas below.

Winning Alliance Qualification Points =  $W + L/2$

Loser Qualification Points =  $L$

Tie Qualification Points =  $W$

Where  $W$  is the winner's score (or either robot's score in a tie),  $L$  is the loser's score. If  $L$  or  $W$  is negative, it will be rounded up to zero when determining qualification scores.

At 3:00pm or as soon as the closest match is concluded, the four robots with the highest accumulated qualification points become the alliance captains for the semifinals. They choose three teams each to play with them in the final 3 vs 3 matches. Each alliance therefore has their own backup robot. Since there are four robots per alliance, one robot will sit out each match. Usually that is the third pick, but the mix is up to the alliance captain. Because there are backups on each alliance, there are no timeouts.

The team with the most qualification points picks first. The top four teams cannot pick one another nor can teams from the same school pick one another. The pick order is 1-4, 4-1, 1-4. The alliances then play in typical FRC fashion; the number 1 alliance plays the number 4

alliance, 2 plays 3. The winners of each of those match ups play for the winner and finalist trophies.

## THE VENUE

The remaining information applies only to the Oregon BunnyBot Competition. Competitions held elsewhere will have their own information here.

BunnyBots is played in the gym at Catlin Gabel School. Map and directions are at <http://www.catlin.edu/map>. Park in the main lot when not dropping off equipment in the circle by the Tennis Court. The pit area will be in covered Tennis Court 1 next to the gym.

The doors open at 8:00am Dec 19th for pit setup and robot unloading. Teams are free to come anytime between 8:00am and 9:30am. (Teams can also drop off robots and pit equipment between 5:30pm and 9:00pm Friday night Dec 18th.) The field will open for teams to practice between 8:30am and 9:30am Saturday. Opening remarks and the drivers meeting will be at 9:30am. We'll start the matches soon thereafter. Qualification matches will be over around 3:00pm followed by alliance selection and elimination matches. Those matches will be over around 4:30pm.

Teams should bring their own lunches or they can buy pizza by the slice on site. There is no off-campus food to speak of within quick walking distance but there is a QFC Supermarket, Starbucks, and Subway about a mile east on Barnes Road.

Whatever driver station solution you choose must be battery powered, as must the laptop if used. This is to ensure that every robot can be turned on and synced with its driver station while in queue speeding up the matches. Teams with laptops with poor batteries, or those using routers as their driver's station radios, may want to invest in an inexpensive inverter driven by a robot battery. A pre-made example is at [www.andymark.com/product-p/am-0626.htm](http://www.andymark.com/product-p/am-0626.htm) or you can wire your own from something like <http://amzn.com/B000NP30HC>.

There will likely be AC power at the driver's stations, which you are welcome to use as long as your laptop stays connected to the robot during the transition from battery power. If we start having power problems, though, this will be the first thing to go.

Teams are **forbidden** from creating any 802.11n WiFi networks unrelated to robot communication, such as for competitive analysis scouting in the stands. Our field management system relies on having speedy WiFi for live scoring. There will be public wifi in the stands for teams to use, but **do not rely on it as we may have to turn it off if we are having issues communicating with the field**. In addition, teams may not create WiFi-based personal hotspots in the stands.

Teams can bring whatever tools and parts they like but they must take care not to damage the surface of the courts. **Bring a tarp to put down in your pit area.**

Teams may not have any drinking fluids other than water in the pit area. When these spill, and they will, it causes significant damage to the surface.

Bring as many charged batteries as you can. The rounds go quickly and the batteries sometimes don't have much time to recharge. If you are a new team, consider borrowing batteries and chargers from a team who isn't taking part or buy extras from AndyMark. The batteries do wear out after a few years so test them before putting them on the field. Bring as many 6 amp or lower battery chargers as you can to the event.

Each team should bring a 8.5" x 11" cardstock with their team number printed on it in portrait orientation. That team number should be at least 4" tall. This is used in lieu of spiffy electronic displays you'd find at a FIRST event and helps the emcee and spectators tell who's controlling what robot. There will be a place to put that card when the team comes to the driver's table. The card could also have the robot name on it if desired.

Bring 100' of extension cord and a powerstrip.

You will need to bring whatever remote control hardware you need. There is no field control system. Teams using the cRIO or RoboRIO will need to operate in the 5Ghz "N" band using either a laptop with dual band N capability, the Linksys router used in 2009, or an aftermarket dual N network adapter plugged into a laptop (like the Classmate) without dual-band N. DO NOT expect to use a laptop with wireless G only as the interference will be extreme and your connection unreliable. The Classmate does not have dual band N capability. Later routers may not be dual band N router, just N in the 2.4 Ghz band. It may be reliable or it may not. We have been using the TRENDnet TEW-684UB dual band N network adapter with good results (<http://amzn.com/B004ZEZC0U>)

Remember, everything must be battery powered and be able to be powered up while in queue to sync the radios before entering the field.

Bring some signage to identify your team's pit area. This doesn't need to be fancy but should be something that's able to support itself that indicates your team number and name to help other teams, queue staff, and refs find you.

No tables or chairs are provided in the pit areas. If you want either, bring them yourself. There are bleachers in the gym competition arena so visitors should not bring their own seating.

The pit area size will be a minimum of 10'x10'.

You'll want to bring your robot cart as the pit areas aren't in the same building as the competition arena. Four inch minimum wheel size.

Catlin Gabel's robotics lab is nearby and is available to teams with major machining needs. That means you don't need to bring large power tools. Bringing a hand drill is always a good idea.