

21ST ONTARIO TECHNOLOGICAL SKILLS COMPETITION

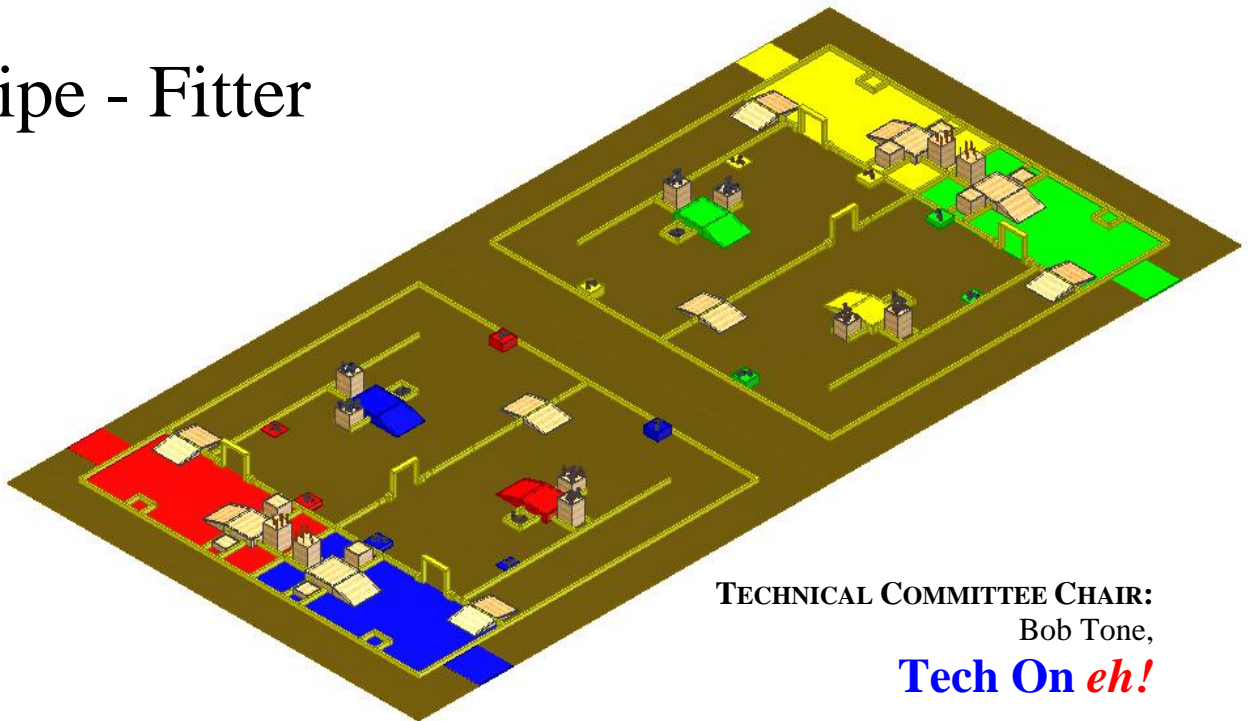
Robotics – Team of 4

Secondary Level

Dates: Two Day Contest - May 17 to 19, 2010
 Location: RIM Park and Manulife Financial Sportsplex, Waterloo, Ontario

Robotics has been an official contest at the OTSC since 1999

Pipe - Fitter



TECHNICAL COMMITTEE CHAIR:
 Bob Tone,
Tech On eh!

Technical Committee Members:

Mario Blouin, Committee Member, Chef des Études Technologiques, École Secondaire de Hearst, Conseil Séparé Catholique de District des Grandes Rivières

Mark Dimonte, Committee Member, Radio Control Expert, Francis Libermann Catholic High School, Toronto Catholic District School Board

FURTHER COMMUNICATIONS

Questions for clarification of the rules can be made to the Technical Committee Chair bobtone@rogers.com. Responses to these questions will be posted on the Skills Canada – Ontario Robotics Competition Website. Participating Teams are expected to periodically check www.skillsontario.com for updates.

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For more information, contact the technical chairs at the email on the front of the scope or the Skills Canada – Ontario Competition Department at otsc@skillsontario.com

**This contest is offered at the Canadian Skills Competition
This contest is offered at the World Skills Competition**

TEAM ONTARIO:

Ontario will be hosting the Canadian Skills Competition (CSC) immediately following the OTSC. **For a student to represent Ontario at the CSC they must be present and ready to commit to attending the CSC at the Closing Ceremony for the OTSC.** They must also attend the Team Ontario meeting immediately following the Closing Ceremony on Wednesday May 19, 2010. Competitors selected to represent Team Ontario need to be prepared to stay with the team from Wednesday, May 19 to Sunday, May 23 in Waterloo. Accommodations for Team Ontario have already been arranged. Thursday, May 20 will be dedicated to a Team Ontario Meeting and a Team Building Workshop.

CANADIAN SKILLS COMPETITION:

The CSC will be hosted immediately following the OTSC.

OTSC - May 17-19, 2010

CSC - May 20-23, 2010

Competitors coming to the OTSC should be prepared to compete at both the OTSC and CSC. This includes bringing the equipment needed for both competitions, as well as preparing for the tasks in both levels of competition.

Details on the Canadian Skills Competition can be found on the national contest scopes posted at http://www.skillsCanada.com/index.php?option=com_content&task=view&id=183&Itemid=224

Please use the current document you are reading and the national scope to prepare for your contest.

Purpose of the Robotics Contest:

To create an engineering project to encourage individuals with different skill sets to form co-operative teams to design, fabricate and operate a robot.

Mission Statement:

The intent of the Skills Canada - Ontario Robotics Contest is to have teams of students independently Designing/Fabricating/Operating Robots capable of completing the presented tasks in competition with other student-fabricated robots. Teams are not allowed to develop or implement strategies based on interfering with their opponent's ability to complete the competition task set. Teams must avoid the purchase, re-use or adaptation of complete systems that were commercially fabricated to address a task set very similar to the Skills Canada – Ontario Robotics Contest. Teams may use the design of commercial mechanisms or systems, which can complete some tasks of the Skills Canada – Ontario Robotics Contest but they must fabricate the mechanisms themselves. It is expected and acceptable that teams will use some newly purchased and recycled parts or components (motors, gears) to fabricate mechanisms, which will complete the Skills Canada - Ontario Robotics Contest tasks. Robots will be inspected for adherence to this statement at the Skills Canada – Ontario Robotics Contest.

Skills and Knowledge Applied:

- Drafting
- Mechanics
- Electronics
- Metalwork
- Woodworking
- Communications

Equipment and Materials

Supplied by the Competitors:

- Robots - Robot accessories (including batteries, battery charger, spare parts)
- Extension cord and power cord
- Résumé
- Various tools required to modify and repair Robots onsite
- Safety equipment including mandatory eye protection

Supplied by the Committee:

- Playing Field including Target Objects (Plumbing Connectors), Target Object Starting/Ending Bins/Platforms/On the Floor Targets plus Ramp and Archway Mobility Components
- One worktable with access to a 120 V power outlet (minimum 100W) per team

Judging Criteria:

On the court performance of the robot in the set task and the job interview component.

Safety:

Safety is a priority at the Ontario Technological Skills Competition. At the discretion of the judges and technical chair any competitor can be removed from the competition site for not having the proper safety equipment and/or not acting in a safe manner.

1. It is mandatory for all competitors to wear CSA approved eyewear (including side shields for prescription eyewear) when performing certain tasks in the pit area such as cutting or chipping materials.*

*Competition judges will have final authority on matters of safety.

Job Interview:

To assist competitors in preparing for their eventual job searches and to become valued employees, there is a “job interview” incorporated into this contest. It is expected that the competitors will arrive **WITH A RÉSUMÉ** and be prepared for interview questions and discussion. Performance in the interview accounts for 5% of the team’s overall mark. Sample interview questions are available at www.skillsontario.com/hr. Please note there are no facilities on site for printing.

Clothing Requirements:

Competitors are to be dressed in a clean and appropriate manner. Competitors are not permitted to wear clothing with logos or printing. The exception to this rule is the logo of the school, school board, college or MTCU District that the competitor is representing. **ONLY** the logo of the institution under which the space is registered can be visible. Corporate logos or names are not permitted on a competitor’s clothing.

Rules and Regulations:

Please be sure to review all rules and regulations in the Complete Competitor Information Package, available online at www.skillsontario.com.

If there is any discrepancy between the English and French information in the scope, the English portion will be taken as the correct information.

Immediate disqualification may occur at the discretion of the technical chair if a competitor displays any one of the following:

- Acts inappropriately
- Shows disregard for the safety of themselves or those around them
- Breaks the established rules and regulations including:

- Uses equipment or material that is not permitted
- Dishonest conduct (cheating)
- Speaks with those outside the contest area
- Arrives to the contest site late

Registration for all contests will happen on the contest site the morning of the competition.

Meals:

Skills Canada – Ontario will provide a lunch and drink for competitors. Lunch will be confirmed closer to the competition; however it is likely to be two slices of pizza and one pop. If participants feel they require additional sustenance, it is highly recommended they bring snacks with them. Any food brought to the venue must be nut free. Any nut products found on-site will be removed.

Competition Agenda:

Ontario Technological Skills Competition

May 17, 2010	
7:00am – 7:30am	Registration
7:30am – 8:00am	Orientation
8:00am – 9:00am	Pre-Inspection
8:00am – 9:00am	Job Interviews
10:00am – 11:30am	Competition
11:30am – 12:30pm	Lunch
12:30pm – 4:30pm	Competition

May 18, 2010	
8:00am – 11:30am	Competition
11:30am – 12:30pm	Lunch
12:30pm – 3:30pm	Competition
2:40pm	Bronze Medal Game
3:00pm	Gold Medal Game

Contest Location: RIM Park and Manulife Financial Sportsplex, 2001 University Avenue East Waterloo – a map is available online at www.skillsontario.com/maps/maps.html

Closing Ceremony

May 19, 2010	
9:00am – 12:00pm	Closing Ceremony – Mandatory
12:00pm – 1:00pm	Team Ontario Meeting – Mandatory

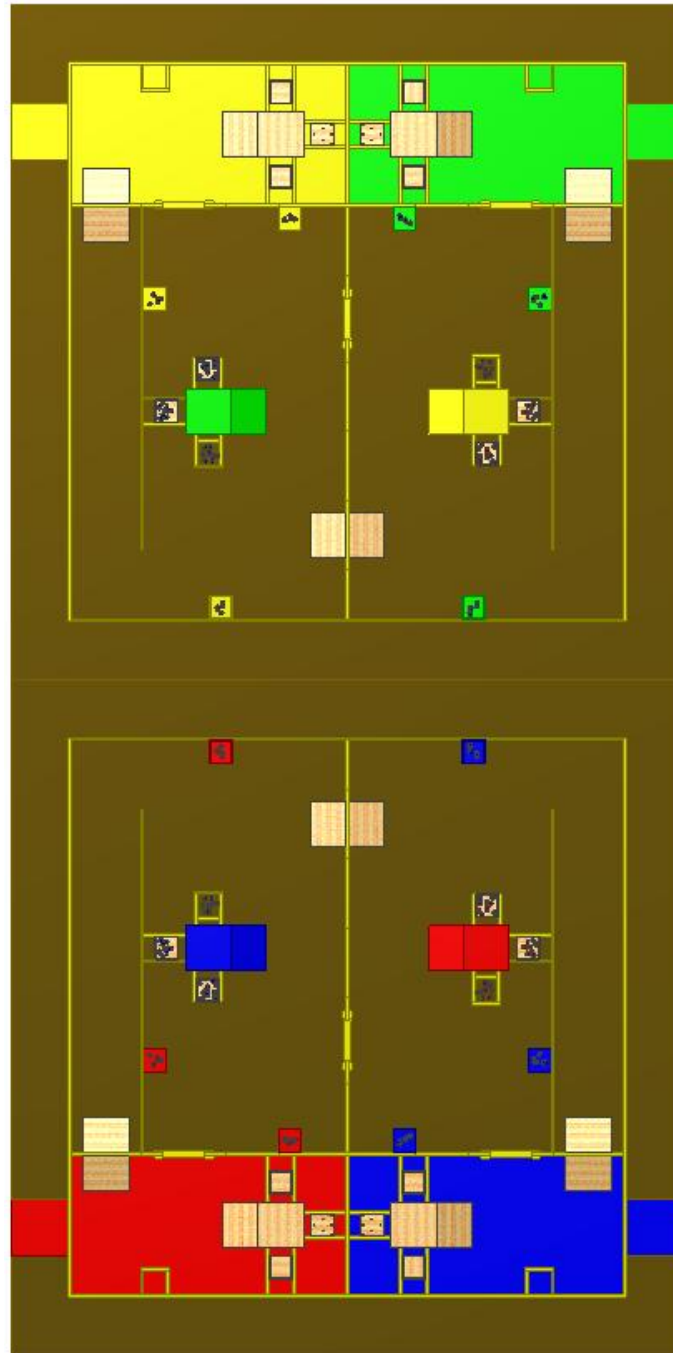
Closing Ceremony Location: Waterloo Memorial Recreation Complex, 101 Father David Bauer Drive, Waterloo – a map is available online at www.skillsontario.com/maps/maps.html. Each Competitor will receive one closing ceremony ticket in their competitor registration bag. Full results for the OTSC will be posted online starting May 20, 2010 at www.skillsontario.com

Additional Information for those advancing to the Canadian Skills Competition

May 19 4:00pm – 6:00pm	Team Ontario Check-in	All members of Team Ontario (including local competitors) are to check into the Team Ontario Hotel.
May 19 6:30pm	Team Ontario Dinner	It is mandatory for all Team Ontario Members to attend.
May 20 Morning	Team Ontario Meeting and Team Building Activity	It is mandatory for all Team Ontario members and Advisors to attend the Team Ontario Meeting and Team Building Activity.
May 20 Evening	Opening Ceremony for the CSC	Team Ontario will attend this event as a group. Located at the Waterloo Recreation Complex.
May 21 All day	CSC	Competition
May 22 All day	CSC	Competition
May 23	Team Picture	At the Waterloo Recreation Complex prior to the Closing Ceremony
May 23 3:00pm	Closing Ceremony for CSC	Team Ontario will attend this event as a group. Located at the Waterloo Recreation Complex.

For a team to represent Ontario at the Canadian Skills Competition they must be present and ready to commit to attending the Canadian Skills Competition at the Closing Ceremony for the Ontario Technological Skills Competition, Wednesday, May 19, 2010.

THE GAME



OVERVIEW

The competition involves Robots traveling through a Shared Open Court Area seeking their Assigned Plumbing Connectors that will be placed in a variety of locations on the court at the start of the game. The Robots are to take possession of their Assigned Plumbing Connectors then deliver them to the Target Destination Location of their choice in their Assigned Home Space.

There will be 24 Competition Target Objects available to each Robot in a game, 4 of each Plumbing Connector shown in the following images.



NIBCO

1-1/2 In. ABS 22 -1/2 Degree Elbow H x H

\$1.54

- Model: C5808112
- Internet/Cat #: 970154
- Store SKU #: 1000116311
- Changes direction of ABS piping 22 1/2 degrees
- Durable and long-wearing
- Easy to install



NIBCO

1-1/2 In. ABS 45 Degree SR Street EL Spg x Hub

\$0.89

- Model: C58062SR112
- Internet/Cat #: 970143
- Store SKU #: 1000421140
- Changes direction of ABS piping 45 degrees
- Durable and long-wearing
- Easy to install



NIBCO

1-1/2 In. ABS 90 Degree SR Elbow All Hub

\$0.72

- Model: C5807SR112
- Store SKU #: 1000421143
- Changes direction of ABS piping 90 degrees
- Durable and long-wearing
- Easy to install



NIBCO
1-1/2 In. ABS Coupling 10/Bag Hub

\$3.65

- Model: CPR5801112
- Internet/Cat #: 970081
- Store SKU #: 1000109515
- Connects ABS piping lengths together
- Durable and long-wearing
- Easy to install



NIBCO
**2 x 1-1/2 In. x 1-1/2 In. ABS Sanitary
Tee H x H x H**

\$2.07

- Model: C58112112112
- Internet/Cat #: 970045
- Store SKU #: 1000421146
- Connects a branch line into a vertical ABS drain line
- Durable and long-wearing
- Easy to install

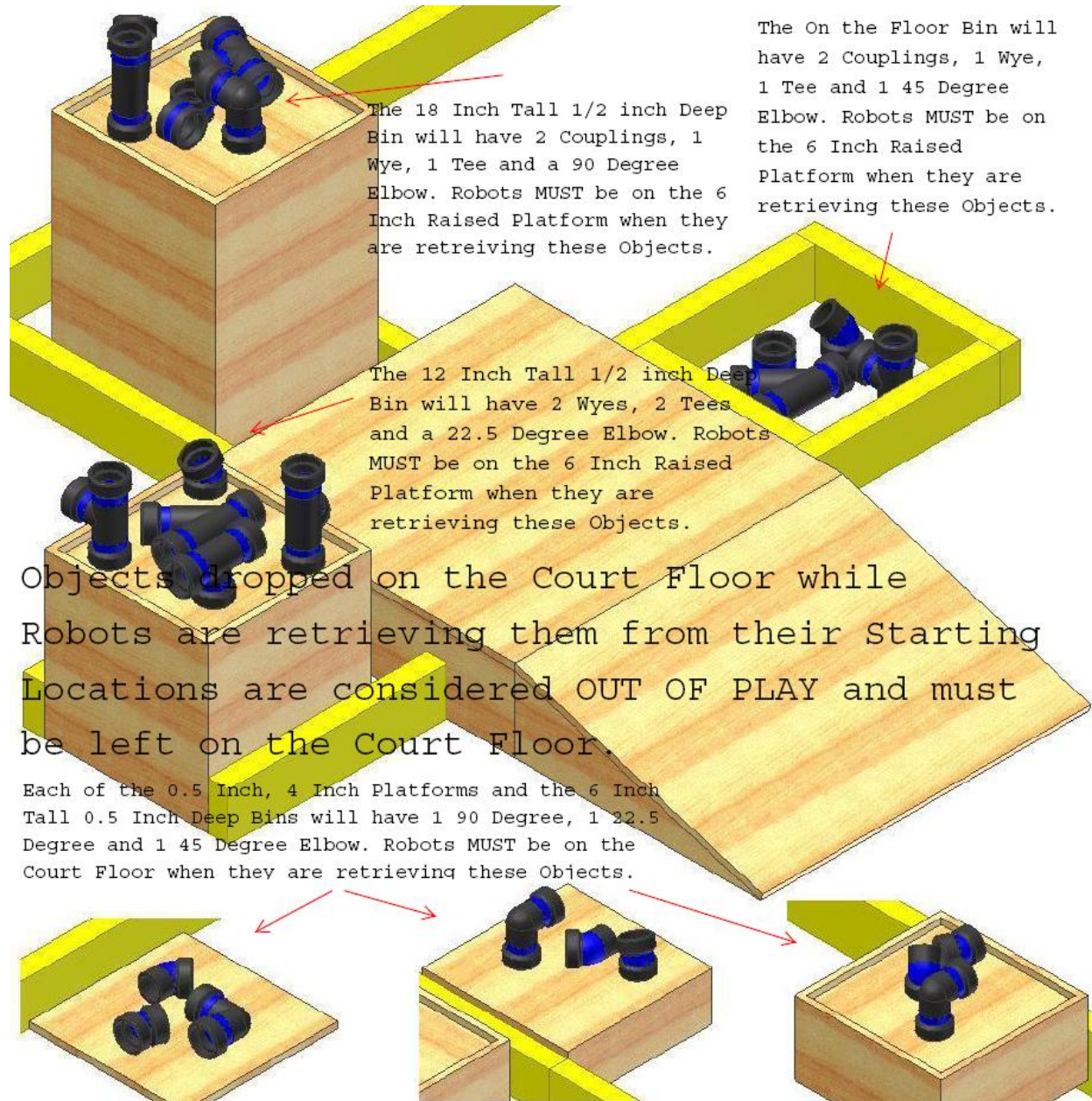


NIBCO
1-1/2 In. ABS 45 Degree Wye All Hub

\$1.84

- Model: C5810CS112
- Internet/Cat #: 970129
- Store SKU #: 1000116344
- Connects a branch line into a horizontal ABS drain line
- Durable and long-wearing
- Easy to install

In Tournament Games, two Robots will simultaneously attempt to complete the competition task. Each Robot will have exclusive use of an Assigned Home Area and a Raised Object Collection Platform positioned in the shared court space.



Robots must be designed and built by students to the criteria outlined in this document.

A pit area is provided so that students may make repairs and improvements to their Robots between games. (Note: Teachers are not permitted in the pit area once the competition has started).

Teams are allowed to remove their Robot from the Competition Area during the over-night period between Day 1 and 2 of the competition.

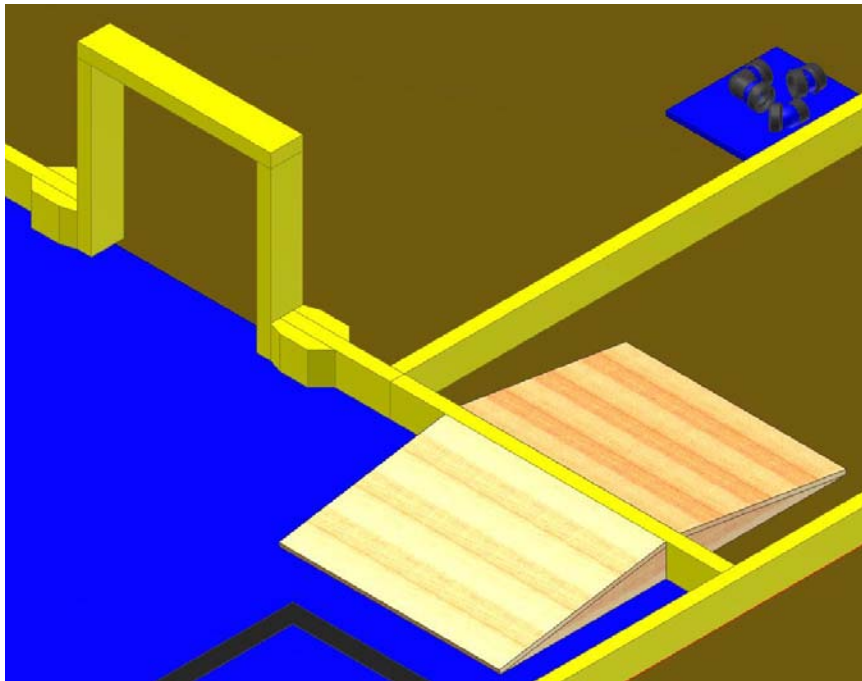
The Pit Area and Competition Court will be available to Teams during Lunch Breaks.

Although two Robots play on the same court at the same time, they must work to advance their score and not detract from their opponent's score.

Strategies aimed at deliberately interfering with or damaging other Robots are not in the spirit of the competition and will not be allowed.

Teams must understand that deliberate bumping/ramming of your opponent robot is not allowed. However, when two very mobile Robots are sharing an open court space **THERE WILL BE ACCIDENTAL ROBOT COLLISIONS**. Teams need to take this into consideration when designing their Robot.

There are **NO** Points awarded for travelling through the 18 inch Archway or over the 24 inch wide Ramp.



SCORING

Seven Points each for placing three Objects on the Back Row Center Peg.

Zero Points for an Object that falls OFF a Peg but stays on the Platform.

Two Points each for Two Objects placed on the Lowest Platform.

One Point for the Object placed in the On the Floor Bin.

Six Points each for placing Objects on both of the Corner / Outside Back Row Pegs.

Five Points each for Two Objects placed on the Second Row Pegs.

Four Points for an Object Placed on the First Row Peg.

ANY Target Object may be delivered to ANY of the Target Destination Locations..
However, Delivery Locations have different values.

Three Points each for Two Objects placed on the Taller Platform.

The Blue Team in this sample would score:

- 1 On the Floor Bin Point
- 4 Lowest Platform Points
- 6 Taller Platform Points
- 4 First Row Peg Points
- 10 Second Row Peg Points
- 12 Third Row Corner Peg Points
- 21 Third Row Center Peg Points
- Total Blue Team Game Score = 58 Points

Medals will be awarded based on:

- Robot on the court performance in the competition task set as identified through the results of tournament play and playoffs as well as the job interview component.

RULES AND REGULATIONS

1. Each robot will be assigned a starting position directly in front of their Driver's Assigned Location. The center of a Robot should be aligned with the center of the Driver's space.
2. Each team will be assigned a Driver's Area along the courtside directly opposite their Home Area Raised Platform.
3. There will be 24 ABS Plumbing Connectors per robot in each Game.
4. Robots must deliver their Assigned Plumbing Connectors to the designated locations in their Home Area.
5. There is NO Restriction on the number of Plumbing Connectors a Robot may be in possession of at a time.
6. Robots ARE ALLOWED to TOUCH or CONTACT the Object Bins, Platforms or Pegs when they are in the act of either retrieving or delivering Plumbing Components.
7. Once a Robot has taken full control of a Target Object (successfully removed the Target Object from its original starting position) then the Robot "Owns that Object" and this robot is free to set it down/drop it on the court floor and pick it up again.

Note:

- a. A Robot will be deemed to be in possession of an object if they are holding the object(s) continuously in their Initial Object Collection System or have control of the objects in their Robot object management system until the Robot has moved completely off the Raised Platform/Ramp Structure and is back on the court.
 - b. A Robot will be deemed to be in possession of an object if they are holding the object(s) continuously in their Initial Object Collection System or have control of the objects in their Robot object management system until the Robot has moved a distance of two feet from the original on the court floor object platform. On the court tape lines will define this distance.
8. Once a Robot places a Target Object in/on any of the scoring locations, the Robot CANNOT remove that object at anytime during the remainder of the game.
 9. Robots must be in their Assigned Home Space when they are delivering Target Objects to Designated Scoring Locations.
 10. Robots cannot modify the Starting or Scoring Target Object Locations in any way.
 11. Robots cannot deliver Target Objects into/on a Scoring Location with the Target Objects held in a container of any kind that remains on/in the scoring location. Example: If Target

Objects are being held in a bag and that Bag of Target Objects is either placed on a scoring platform, or in a scoring bin or hung on a scoring peg, then these Target Objects will score ZERO Points.

12. Robots MAY place Target Objects past the end of the Scoring Pegs as long as this is accomplished using only the Target Objects themselves. One example of this possible situation is shown in the image below.



13. Robots may NOT take possession of their Opponent's Plumbing Connectors.
14. Robots may NOT travel onto their Opponent's Assigned Raised Platform in the Shared Court Space.
15. Teams may NOT install a camera, mirror or other image generating device on their robot for the purpose of projecting an image visible to either the Spotter or Driver.

ROUND ROBIN TOURNAMENT PLAY

1. Teams will play in tournament games.
2. Tournament Standing will be based on the total number of points scored by a team member in all of their combined tournament games.
3. The top 16 teams after tournament games are completed will advance to the playoff rounds.
4. Two Robots will play on the court in round robin games.
5. Round robin games will last four minutes.
6. The amount of time between games will be determined by the number of participants. This information will be provided to teams at the start of the round robin.
7. Between round robin games, battery changes and repairs to Robots may be completed at the team's assigned Pit Area Worktable.
8. During the competition, students must maintain safety at industry standards such as the wearing of safety glasses when performing cutting or stock removal chipping tasks and maintaining a clean Pit Area Workspace.
9. During game play, referees will have ultimate authority over game rulings, and will have full authority over team conduct in the court area.
10. Damaging the court and/or the Plumbing Connectors is illegal. If a Robot's design causes damage to the court or the Plumbing Connectors, it will not be allowed to compete until it can operate without causing damage. Games missed due to this situation will be forfeited.
NOTE: Damage is considered to be BREAKING court components. Robots bumping into court components and causing them to shift position without breaking any court element will NOT be considered to be damaging the court. It is expected that all court components will be fixed firmly in place so that the court is a Neutral Factor in the competition.
11. Deliberate strategies aimed at the destruction, collision, damage, overturning, entanglement or active blocking of competitor Robots are not in the spirit of the game and are strictly forbidden. Forfeiture of, and removal from the match will result with the first occurrence. Expulsion from the competition will occur after the second. Ramming and pushing are not allowed.
12. If teams must withdraw from a scheduled game due to mechanical problems then they are asked to inform the Referee as promptly as possible of their decision to Default 'Forfeit the Game'.
13. Competitors cannot enter onto the court surface or make adjustments to their Robot during a game.
14. If a Robot is malfunctioning and represents a hazard to participants, other Robots or itself in the opinion of the Referee, the referee may stop the clock and may authorize the

- removal of that Robot from the court during a game. Disabled Robots or parts of Robots not generating any safety concerns will be left on the court until the game time expires.
15. Teams will be allowed two competitors in the courtside area. Drivers and Spotters may switch roles during a game. The Driver is the competitor holding the radio and controlling the Robot. The Spotter is the competitor providing navigational guidance to the Driver through verbal instructions and hand gestures.
 16. Drivers must remain in their Assigned Area throughout the game.
 17. Spotters may move freely within the shared Spotter's areas.
 18. Spotters may **not** enter an opponent team's Drivers area.
 19. At the start of a game, Robots are expected to be in their assigned starting position. Games will start on time. Teams are responsible to know when their games are scheduled. Robots arriving **AFTER** the game has started will be allowed to enter the game and use the Time remaining in the four minute game.
 20. Competitors must remain outside the court boundaries.
 21. Robots must not leave the competition court at any time during a game.
 22. It will be a referee's ruling that decides if an 'End of the Game Plumbing Component Delivery' took place before or after the game-ending buzzer sounded.
 23. Plumbing Components landing outside the court boundaries, as a result of Robot Behavior, **will not be returned** to the Competition Court.
 24. Robots **may not park** in front of their Opponents Assigned Raised Platform in the Shared Court Space for the sole purpose of blocking access to it by an opponent.

ROUND ROBIN TOURNAMENT STANDING

Round Robin Tournament Standing will be determined by the total number of points scored by a Robot in all of their combined tournament games.

1. A game score of Zero (0) will be awarded for robots that do not show up for (default) a game.
2. A game score of Zero (0) will be awarded for robots that do not deliver a single Plumbing Connector into any of the Designated Locations in their Home area.
3. Total Round Robin Standing ties will be broken by playing special four minute tiebreaker games involving the Robots that are tied.

PLAYOFF PLAY

1. The top 16 scoring teams will advance to the playoffs.
2. Two Robots will play on the court in playoff games.
3. Playoff games will be Standard Game Length (four minutes).
4. Playoff games cannot end in a tie. If a tie score exists in a Playoff Game then additional four minute periods will be played (as many as needed) until one of these extra periods ends with one team ahead. Note: Teams will be allowed to return to their Pit Area Table to make repairs, change batteries between the extra periods of a playoff game. If 'Overtime Periods' are required the time between these periods will be set at four minutes.

The Playoffs will be structured on a Double Knock-Out Format. Teams will need to lose TWO Playoff Games to be eliminated.

Initial Playoff Game Pairings will be based on the Final Round Robin Tournament Standings.

The Playoff Pattern presented is based on 16 teams advancing to the Playoffs from Tournament Play.

2010 Skills Ontario Robotics Challenge / 16 Team Double Knock Out Playoff Pattern

Playoff Round 1: Placement Based On Final Tournament Standings	Playoff Round 2: Placement Based On Rnd 1 Results Plus Final TS
Playoff Game One	Winner's Ladder: Playoff Game Nine
Tournament TEAM # 1 vs. Tournament TEAM # 16	Highest Ranked Rnd 1 Winner vs. Lowest Ranked Rnd 1 Winner
Game # 1 Loser moves to the Elimination Ladder	Game # 9 Loser moves to the Elimination Ladder
Playoff Game Two	Winner's Ladder: Playoff Game Ten
Tournament TEAM # 2 vs. Tournament TEAM # 15	2nd Highest Ranked Rnd 1 Winner vs. 2nd Lowest Ranked Rnd 1 Winner
Game # 2 Loser moves to the Elimination Ladder	Game # 10 Loser moves to the Elimination Ladder
Playoff Game Three	Winner's Ladder: Playoff Game Eleven
Tournament TEAM # 3 vs. Tournament TEAM # 14	3rd Highest Ranked Rnd 1 Winner vs. 3rd Lowest Ranked Rnd 1 Winner
Game # 3 Loser moves to the Elimination Ladder	Game # 11 Loser moves to the Elimination Ladder
Playoff Game Four	Winner's Ladder: Playoff Game Twelve
Tournament TEAM # 4 vs. Tournament TEAM # 13	4th Highest Ranked Rnd 1 Winner vs. 4th Lowest Ranked Rnd 1 Winner
Game # 4 Loser moves to the Elimination Ladder	Game # 12 Loser moves to the Elimination Ladder
Playoff Game Five	Elimination Ladder: Playoff Game Thirteen
Tournament TEAM # 5 vs. Tournament TEAM # 12	Highest Ranked Rnd 1 Loser vs. Lowest Ranked Rnd 1 Loser
Game # 5 Loser moves to the Elimination Ladder	Game # 13 Loser is Eliminated
Playoff Game Six	Elimination Ladder: Playoff Game Fourteen
Tournament TEAM # 6 vs. Tournament TEAM # 11	2nd Highest Ranked Rnd 1 Loser vs. 2nd Lowest Ranked Rnd 1 Loser
Game # 6 Loser moves to the Elimination Ladder	Game # 14 Loser is Eliminated
Playoff Game Seven	Elimination Ladder: Playoff Game Fifteen
Tournament TEAM # 7 vs. Tournament TEAM # 10	3rd Highest Ranked Rnd 1 Loser vs. 3rd Lowest Ranked Rnd 1 Loser
Game # 7 Loser moves to the Elimination Ladder	Game # 15 Loser is Eliminated
Playoff Game Eight	Elimination Ladder: Playoff Game Sixteen
Tournament TEAM # 8 vs. Tournament TEAM # 9	4th Highest Ranked Rnd 1 Loser vs. 4th Lowest Ranked Rnd 1 Loser
Game # 8 Loser moves to the Elimination Ladder	Game # 16 Loser is Eliminated

2010 Skills Ontario Robotics Challenge / 16 Team Double Knock Out Playoff Pattern

Elimination Ladder		Winners Ladder	
Playoff Game Nineteen		Playoff Game Seventeen	
Winner's Ladder Game 9 Loser	vs. Elimination Ladder Game 16 Winner	Highest Ranked Game 9, 10, 11, and 12 Winner	Lowest Ranked Game 9, 10, 11 and 12 Winner
Game # 19 Loser is Eliminated from the competition		Game # 17 Loser moves to the Elimination Ladder	
Playoff Game Twenty		Playoff Game Eighteen	
Winner's Ladder Game 10 Loser	vs. Elimination Ladder Game 15 Winner	Second Highest Ranked Game 9, 10, 11 and 12 Winner	Second Lowest Ranked Game 9, 10, 11 and 12 Winner
Game # 20 Loser is Eliminated from the competition		Game # 18 Loser moves to the Elimination Ladder	
Playoff Game Twenty-One			
Winner's Ladder Game 11 Loser	vs. Elimination Ladder Game 14 Winner		
Game # 21 Loser is Eliminated from the competition			
Playoff Game Twenty-Two			
Winner's Ladder Game 12 Loser	vs. Elimination Ladder Game 13 Winner		
Game # 22 Loser is Eliminated from the competition			
Playoff Game Twenty-Three			
Elimination Ladder Game 20 Winner	vs. Elimination Ladder Game 21 Winner		
Game # 23 Loser is Eliminated from the competition			
Playoff Game Twenty-Four			
Elimination Ladder Game 19 Winner	vs. Elimination Ladder Game 22 Winner		
Game # 24 Loser is Eliminated from the competition			

2010 Skills Ontario Robotics Challenge / 16 Team Double Knock Out Playoff Pattern

Elimination Ladder		Winners Ladder	
Playoff Game Twenty-Six			
Winner's Ladder Game 17 Loser	vs.	Elimination Ladder Game 23 Winner	Winner's Ladder Game 18 Winner
Game # 26 Loser is Eliminated from the competition			
Playoff Game Twenty-Seven			
Winner's Ladder Game 18 Loser	vs.	Elimination Ladder Game 24 Winner	Elimination Ladder Game 29 Winner
Game # 27 Loser is Eliminated from the competition			
Playoff Game Twenty-Eight			
Elimination Ladder Game 26 Winner	vs.	Elimination Ladder Game 27 Winner	
Game # 28 Loser is Eliminated from the competition			
Playoff Game Twenty-Nine			
Winner's Ladder Game 25 Loser	vs.	Elimination Ladder Game 28 Winner	
Game # 29 Winner Returns to the Winner's Ladder			
Loser of Game 29 is THE BRONZE MEDAL TEAM.			
Playoff Game Thirty			
Winner's Ladder Game 25 Winner	vs.	Elimination Ladder Game 29 Winner	
IF this is their SECOND LOSS the Loser of Game 30 is the SILVER MEDAL Team and the Game 30 Winner IS THE GOLD MEDAL TEAM. IF this is the Game 30 Losing Team's FIRST LOSS then a Game 31 will be held.			
Playoff Game Thirty-One			
Winner's Ladder Game 25 Winner	vs.	Elimination Ladder Game 29 Winner	
Game # 31 will be held ONLY IF Game 30 was the losing Team's FIRST LOSS			
Game 31 Loser IS the SILVER MEDAL TEAM			
Game 31 Winner IS the GOLD MEDAL TEAM			

THE COURT

COURT LAYOUT

Please note: Although great pains will be made to keep the court in compliance with the drawings, some inaccuracies in construction may occur. Please make your Robot designs allowing for a possible ½” tolerance.

The primary court items that have a direct bearing on Robot design are:

- 1) The open court surface consists of **amazonite** sheets smooth side up with duct taped seams, OR the Good Side of a Good One Side Plywood Sheet, OR, the smooth facility floor.
- 2) The perimeter court wall is made from two by four inch planks laying on their narrow edge.
- 3) All Ramps and Platforms will be Un-painted Plywood surfaces.

Detailed court information has been included in the Appendix Section of this scope document.

Note: An AutoDesk Inventor 3D Model of the court is available on www.skillsontario.com.

THE ROBOT

RESTRICTIONS

All Robots must **pass** a pre-competition inspection for compliance with the safety and design rules before they will be allowed to participate in tournament games.

Note: Robots must remain in compliance with these rules throughout the competition. If teams fall out of compliance with these rules, they will not be permitted to compete and will forfeit all of their scheduled games until they have corrected the problem.

START OF THE GAME ROBOT STATUS

When a Robot's main power is turned on prior to the start of a game, the Robot must be in an overall 'Idle State' and the following conditions must exist:

The Robot must be stationary in its assigned starting location.

- All systems may be ON.
- All required System Start-up Adjustments must be completed.
- All Electrical/Mechanical Systems and Student Made Electronic Circuits must be under the control of a Kill Switch(es).

- Air System Circuits may be fully charged to 90 PSI and their compressors can be ON.

OVERALL ROBOT SIZE

Robots must not exceed an overall size of eight cubic feet (13,824 cubic inches) at the start of each game. Robots may expand to a larger size once a game has started.

Overall Robot size will be calculated by using the maximum single dimension in each category (length/width/height) of the robot, not average dimensions.

This overall size maximum will allow a Robot to be any of the following example sizes, or indeed some other variation that does not exceed 13,824 cubic inches:

- (a) an overall dimension of **24 by 24 by 24-inches**, (13,824 cubic inches), or
- (b) an overall dimension of **42 by 18 by 18-inches**, (13,608 cubic inches), or
- (c) an overall dimension of **36 by 21 by 18-inches**, (13,608 cubic inches), or
- (d) an overall dimension of **48 by 24 by 12-inches**, (13,824 cubic inches).

NOTE: The top of your Robot's radio antenna may be a maximum of 48" above the court floor. The radio antenna is not considered when defining the overall Robot size.

Metric Robot Size Conversion:

$$24 \text{ inch} = 60.96 \text{ cm} \qquad 61 \text{ cm} \times 61 \text{ cm} \times 61 \text{ cm} = 226,981 \text{ cubic cm}$$

$$\text{Eight cubic foot} = 226\,534.773\,693\,507 \text{ cubic cm}$$

OVERALL ROBOT WEIGHT

- No weight restriction is imposed on the Robots.
- Robots should be built with robustness in mind. Accidental bumps and scrapes will happen.
- Teams must consider protection of sensitive components and durability of exposed ones when designing all elements of their Robots.

ALLOWED PARTS LIST

A quick note about manufactured parts: Although it is impossible to create a comprehensive list of all acceptable parts, a list has been made to provide guidance for teams.

Acceptable components:

- electronic speed controllers
- motors
- gears
- sprockets
- chains
- belts
- pulleys
- tires
- rims
- bearings
- compressed air tanks
- gauges
- tubing connectors
- RC transmitter/receiver
- servo motors
- batteries
- harvested gearboxes from mechanical devices
- PLC unit and interface

Examples

Wheel assembly: tire, tube, hub & bearing.

Power plants: this could involve complete core systems. The intention is to enable power to be delivered to student-created mechanisms.

- A power drill where the complete motor/gear box/clutch/chuck is used.
- An automobile power headrest motor/flexible drive shaft/linear gear assembly are used.
- A photocopier chain drive involving the motor/drive shaft/drive chain sprocket is used.
- A photocopier gearbox to be used to manage a non-photo-copier motor.
- An electric scooter or wheelchair motor mounted on a student designed and created frame.

It is a team's responsibility to ensure Robot compliance to standards.

Note: It is not acceptable to use complete 'out of the box systems' such as a Track Drive System where all components (motors, wheels, track belts, mounting frame, tension wheels) were manufactured to work together.

POWER SOURCES/MANAGEMENT

1. The total voltage in any individual circuit **cannot** exceed **24 Volts**.
2. The **maximum continuous** power rating allowed in any circuit is **240 W**, which will be limited by voltage and fuse selection. Example: 12Volts*20 Amps=240 Watts
3. Teams are reminded that it is the purpose of a fuse to protect the students themselves and the equipment in their circuits. Teams must develop circuit diagrams and calculate the appropriate values for all circuits on their Robot. Teams must submit a wiring diagram of their Robot's circuits.
4. Each current branch path from the battery must include either an **in-line fuse, circuit breaker** or be connected to a dedicated fuse in a rack.
5. Teams must use a wire gauge which is appropriate to the current values in each circuit.
6. Batteries must be complete sealed commercial battery packs.
7. All **wires** and **batteries** are to be mounted **securely** to the Robot taking into consideration that they must be protected from damage due to abrasion when the various Robot elements move.
8. Teams are responsible for charging their own batteries and must have a complete set of batteries. It is recommended that a spare set be available.
9. Teams may apply voltages to a motor up to 150% of the motor's marked rating. Note: Teams attempting this must thoroughly test their systems to ensure the motors do not "smoke" under all possible conditions.
10. Robots must be able to be turned off with a single motion. Radio receivers may be in an independent circuit.
11. Teams may use new or re-cycled motors. See list of allowable parts.
12. There is no restriction on the number of motors used on a single Robot.
13. No explosive materials of any kind may be used (ether, gunpowder, acetylene).

NON-ELECTRICAL (BATTERY) ENERGY SOURCES

Pressure based energy sources (air or other) may be pre-charged to a maximum of 90-PSI pressure in their reservoirs (cylinders) at the start of each game.

1. Air pressure systems using Competitor-made or modified air pressure hardware are NOT permitted.
2. All pressurized tanks on Robots must have a pressure gauge to indicate the stored pressure and a form of automatic overpressure safety relief.
3. The pressure tanks and related gauges/controls must be shielded from damage due to collisions or flying target objects.
4. The stored pressure in the tank must not exceed a maximum of 90 PSI at any time.

5. Tension-based energy sources (elastics, springs or other) may be in either a relaxed at rest state or in a tense/compressed state at the start of each game.
6. Laser devices are prohibited.

RADIOS

1. All teams must use **ground frequencies (75 MHz)** for their RC transmitters or Park Flyer Radio Control units (ones with a limited performance range, 500 feet) which use 2.4GHz Spektrum DSM technology such as those described at http://www.modelflight.com.au/rc_model_radio_control/spektrum_dx6.htm. **Note:** If any signal interference issues arise with WAN's or Phones when using the 2.4 GHz units, it is the team's responsibility to resolve, not the Robotics Challenge Technical Committee.
2. **Only six channels of a Single RC radio/Single Receiver Set can be used.**
3. Robots may not transmit information or a signal of any type to 'Off the Robot' devices.
4. All teams must report their radio information to the Skills Canada - Ontario Robotics Contest Technical Committee in advance of the competition so that potential signal conflicts can be identified and resolved prior to the competition. It is a team responsibility to ensure that their radio does not interfere with an opponent's radio.

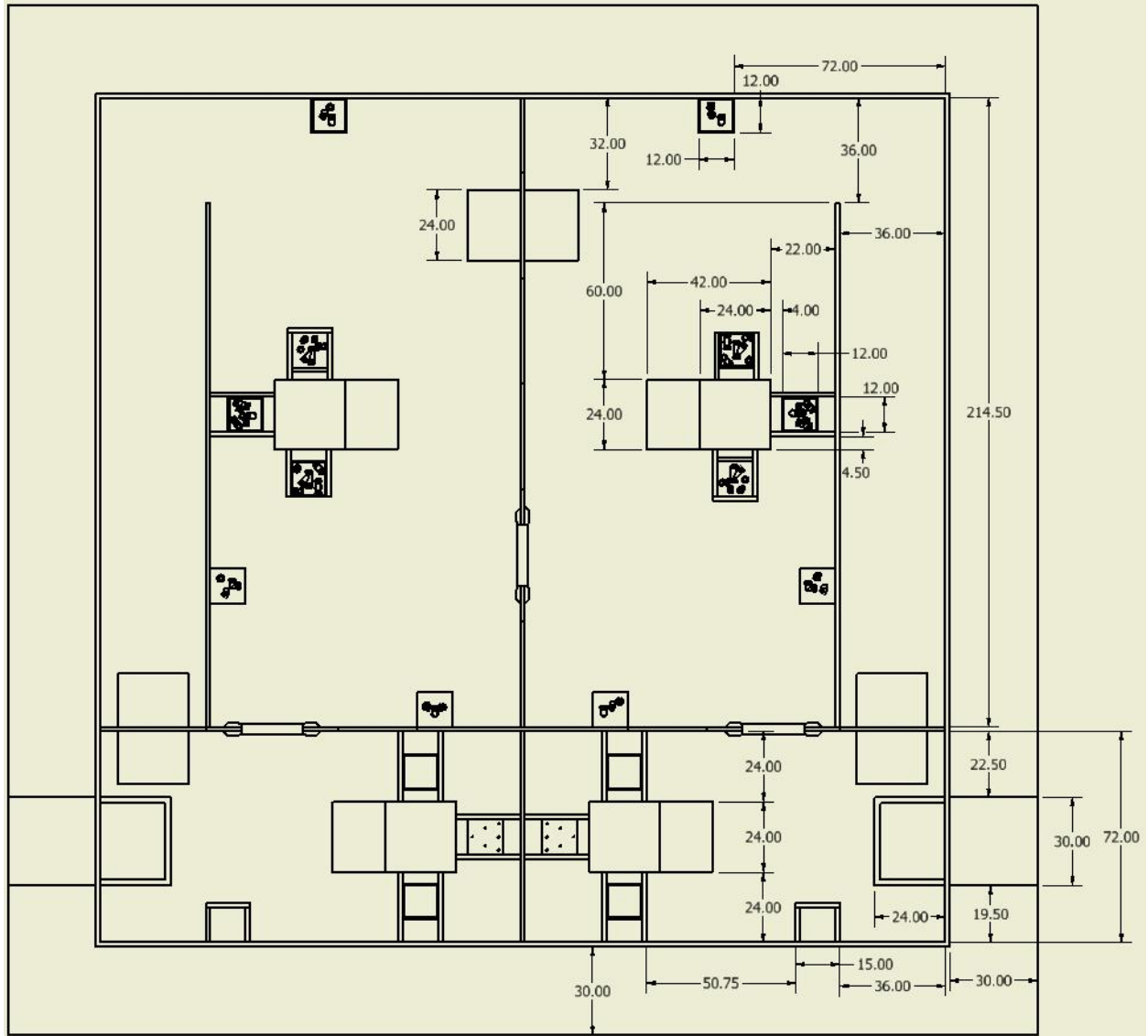
PIT AREA

1. Only registered Robot competitors are permitted in the pit area.
2. Designated teacher/industry team advisors are permitted in the pit area **only** to inspect the worktable setup of their team prior to the start of the tournament.
3. Designated teacher/industry team advisors are **not** allowed in the pit area during tournament and playoff play.
4. Teachers and industry advisors are not permitted to handle tools or Robot parts. Students must make all repairs and modifications on their Robot.
5. Teams will be provided with *Pit Area Workspace* on a standard project table. Depending on the number of teams and availability of space, teams may have to **share** a 60 by 30 inch table.
6. Each pit area table will have access to one electrical outlet. Teams are requested to bring a 25-foot multi-outlet extension cord/power bar as part of their equipment.
7. It is required that teams fabricate a **tabletop stand** for holding their Robot in the pit area. This stand should hold the Robot securely and be capable of preventing the Robot from driving on or off the table in the case of either deliberate motor testing during repairs or due to random, unexpected motor activity.

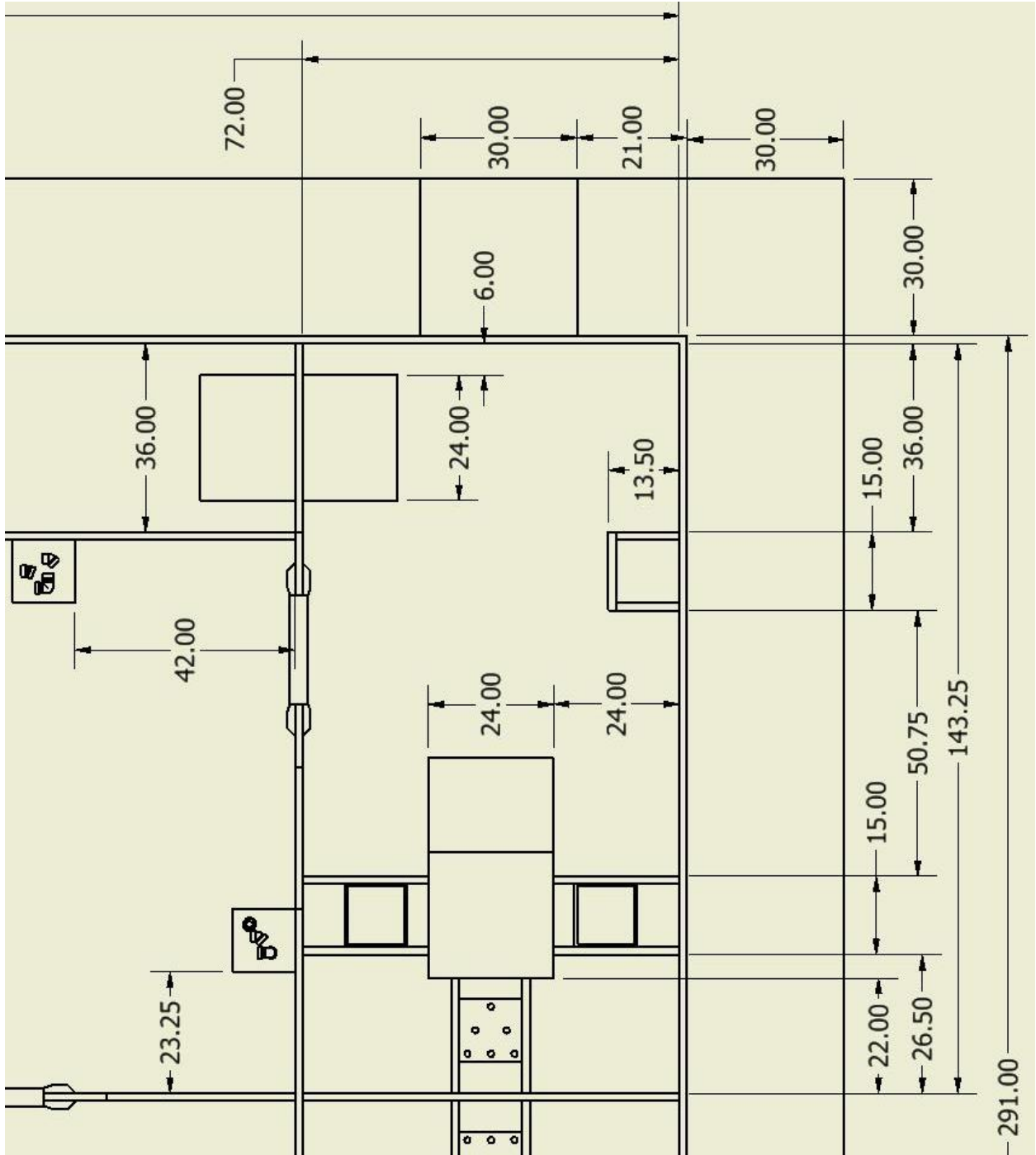
APPENDIX

Overall Dimensions:

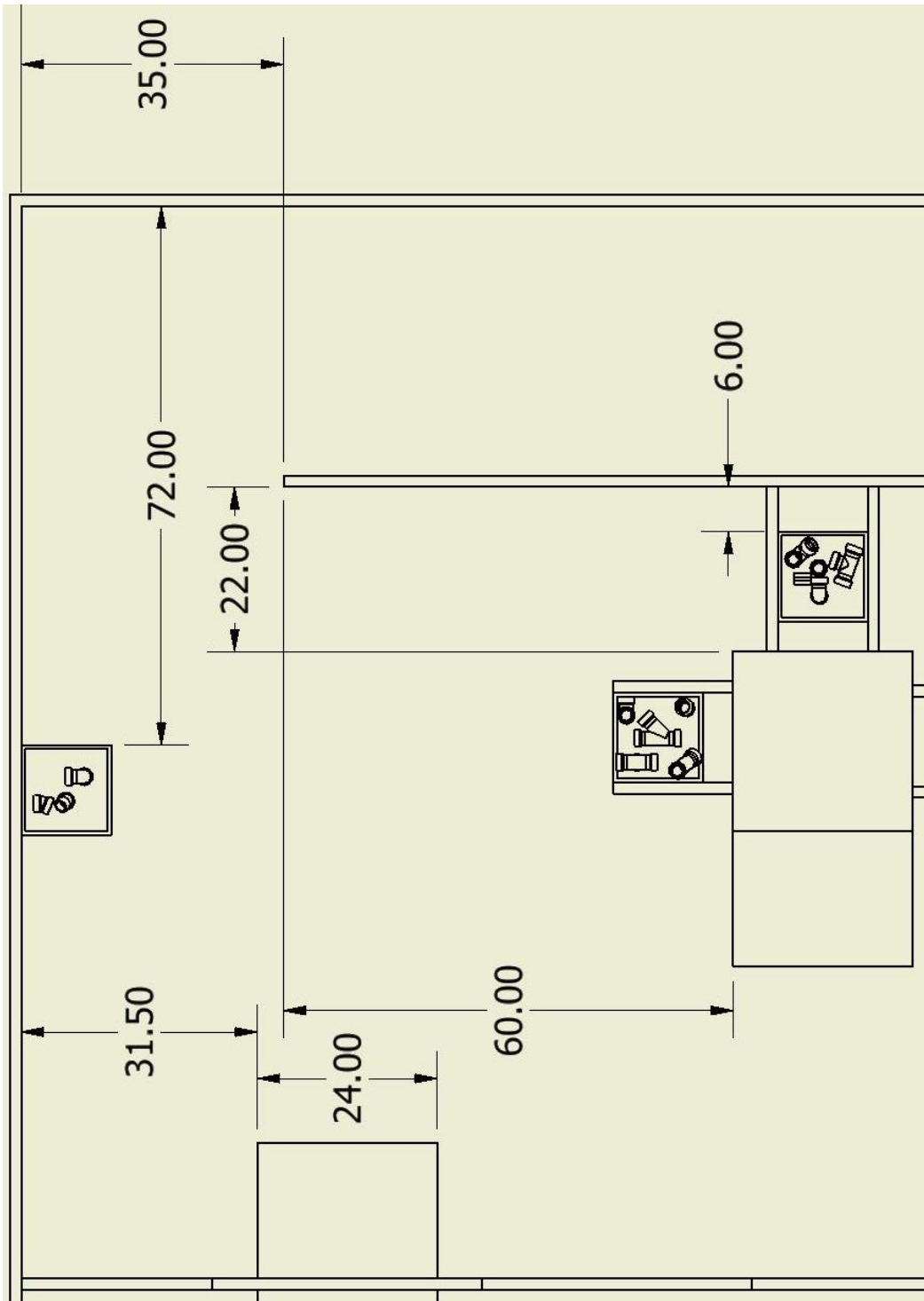
- The Court Playing Surface will be 24 by 24 feet.
- The Perimeter Court Walls will be made using two by four inch planks.
- This wall will as a result be approximately 3.5 inches tall.
- All Ramps, Bins and Platforms will be Plywood (Good Side Up).



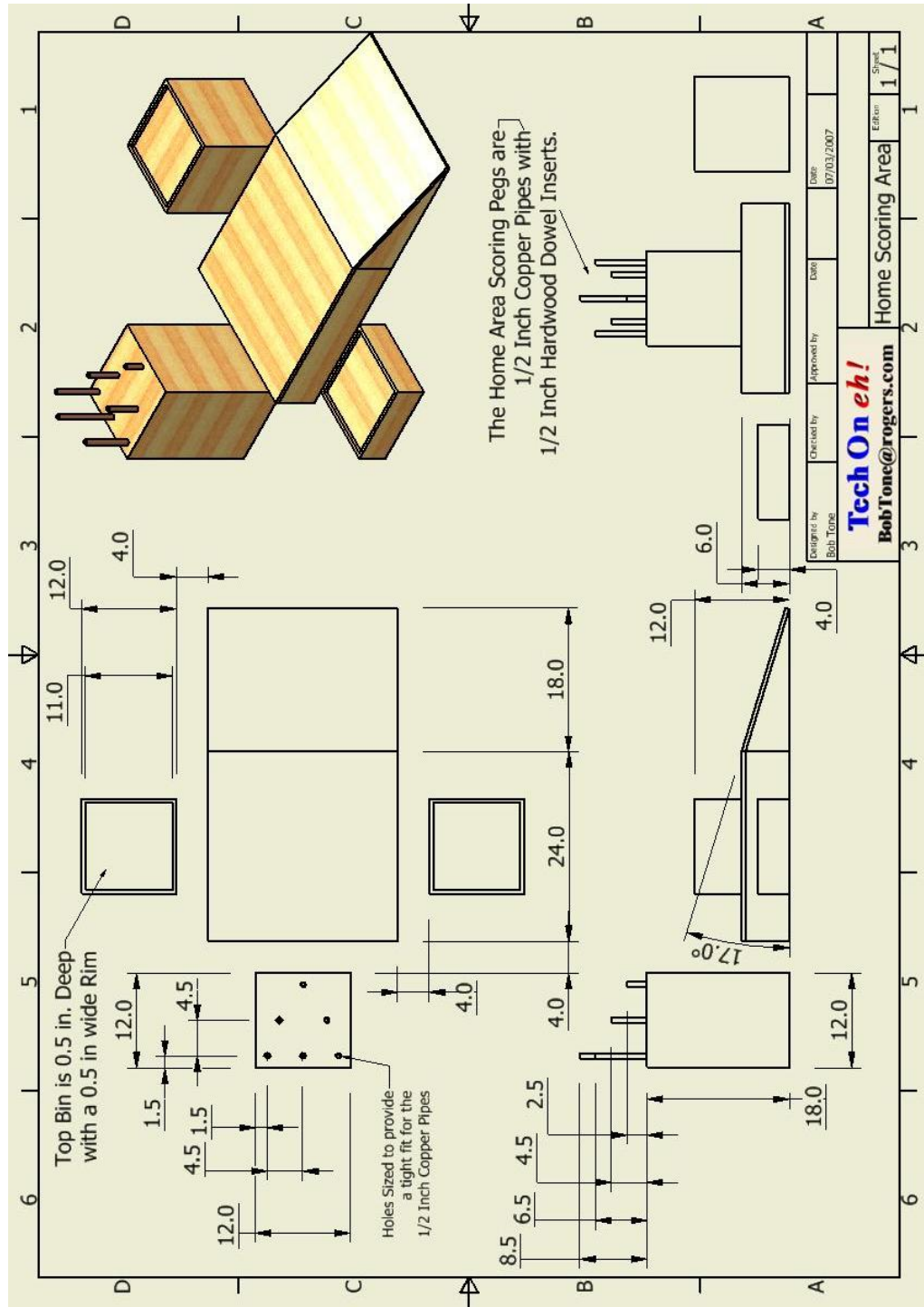
TEAM HOME AREA DETAILS:



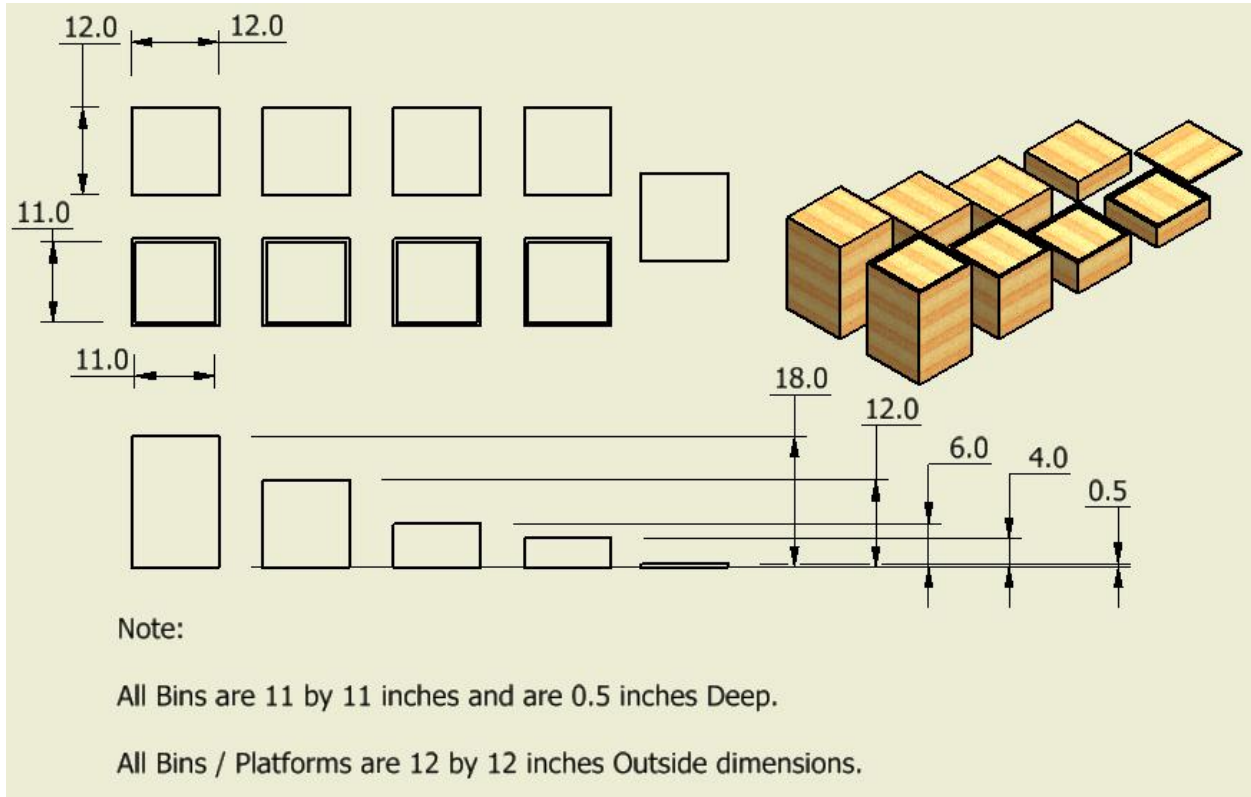
OPEN COURT AREA DETAILS:



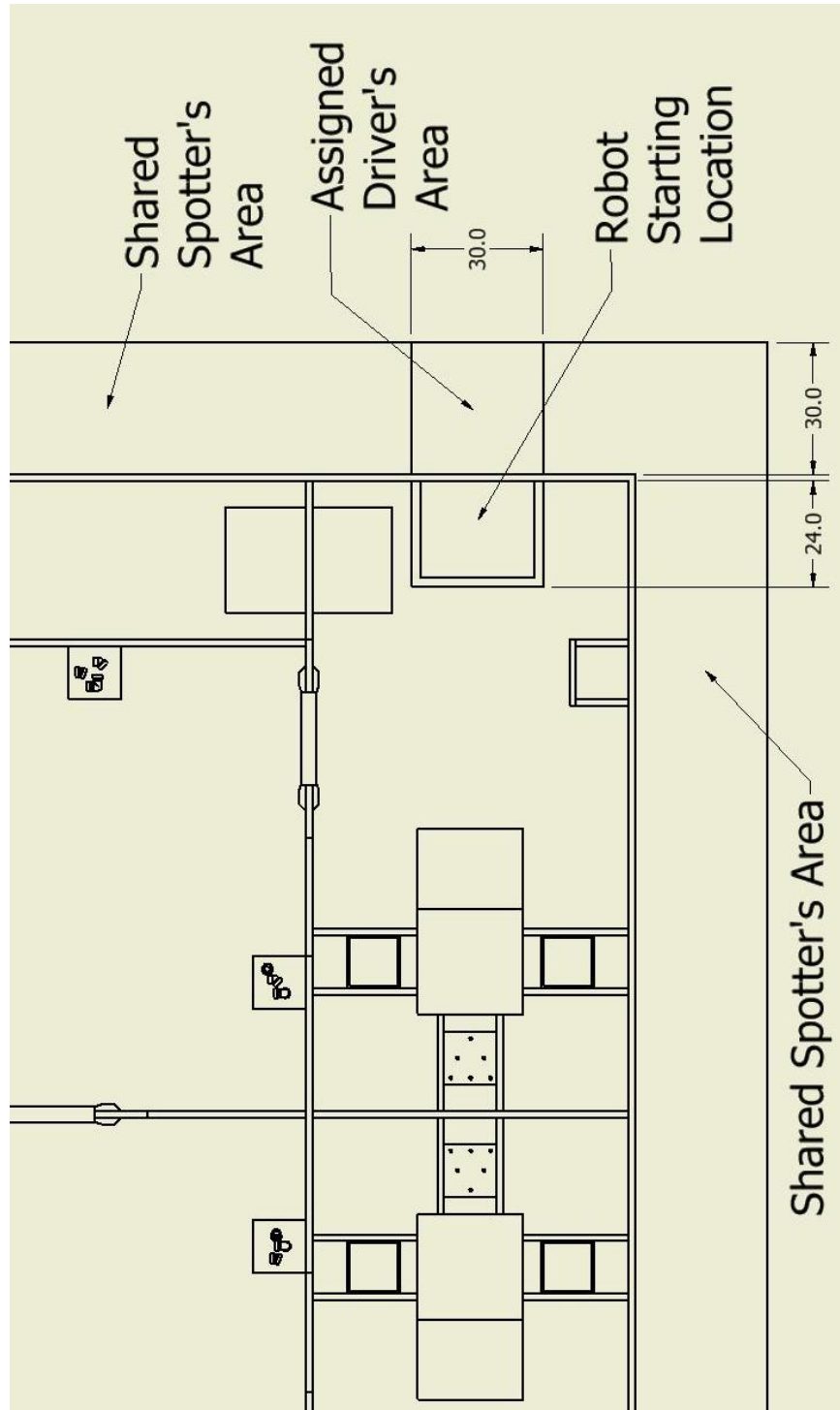
HOME SCORING AREA DETAILS:



BIN/PLATFORM DETAILS



DRIVER'S AREA/ROBOT STARTING POSITION



PRE-INSPECTION FOR COMPLIANCE WITH SAFETY AND DESIGN RULES

- Overall volume $\leq 8 \text{ ft}^3$ (Antenna not counted) (or $13,824 \text{ in}^3$)
- Antenna $< 4 \text{ ft}$ from court floor
- Table Top Robot Stand
- No explosives/combustibles
- No lasers
- All batteries are sealed commercial batteries in good physical condition
- Batteries wired in series should be the same amp hour rating (ex. both 1500 mAh) and batteries in parallel are of same voltage (ex. both 12 volts)
- Batteries securely mounted
- Total voltage in any individual circuit does not exceed 24V
- No circuit exceeds 240W (Voltage x Fuse Current Rating)
- All circuits have a fuse or breaker (breakers must have **DC rating**)
- Appropriately gauged wiring for each circuit
- Wires and connections are in good physical condition
- Wires and connections are not exposed to physical abrasion
- Motors not over-voltaged by more than 50% (a 12V motor can be run at 18V)
- Mandatory Wiring Diagram provided
- No Competitor-made or modified air pressure hardware being used
- Pressure tanks (cylinders) commercially manufactured if pressure in system exceeds 30 psi
- Pressure indicator
- Pressure in tanks does not exceed 90 psi (6.2 bar)
- Over-pressure safety valve
- Pressure tanks and related gauges and controls are shielded from damage due to collisions
- Mandatory Pressure System Circuit Diagram provided
- Robot is able to be turned off with a single motion. Radio receivers may be in an independent circuit
- Only 6 channels of a single radio control unit are used for communications
- Demonstrate robot functionality with rated fuses
- Additional concerns:

Robot Evaluator Signature:

Team Representative Signature:
