



Contest Description

Edmonton Expo Centre, Edmonton

May 3 & May 4, 2023

EVENT: Robotics	LEVEL: Secondary																
WORLD SKILLS TRADE #: 18	LOCATION: Hall A, Edmonton Expo Centre, Edmonton																
DURATION: 16 hrs (Two Days)	REGIONALIZED: No																
COMPETITION SCHEDULE: <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> May 3: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>ORIENTATION</td><td>8:00am – 9:30am</td></tr> <tr><td>COMPETITION</td><td>9:30am – 12:00pm</td></tr> <tr><td>LUNCH</td><td>12:00pm – 1:00pm</td></tr> <tr><td>COMPETITION</td><td>1:00pm – 4:00pm</td></tr> </table> </div> <div style="width: 48%;"> May 4: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>ORIENTATION</td><td>8:00am – 9:30am</td></tr> <tr><td>COMPETITION</td><td>9:30am – 12:00pm</td></tr> <tr><td>LUNCH</td><td>12:00pm – 1:00pm</td></tr> <tr><td>COMPETITION</td><td>1:00pm – 4:00pm</td></tr> </table> </div> </div>		ORIENTATION	8:00am – 9:30am	COMPETITION	9:30am – 12:00pm	LUNCH	12:00pm – 1:00pm	COMPETITION	1:00pm – 4:00pm	ORIENTATION	8:00am – 9:30am	COMPETITION	9:30am – 12:00pm	LUNCH	12:00pm – 1:00pm	COMPETITION	1:00pm – 4:00pm
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COMPETITION	1:00pm – 4:00pm																
The times above are approximate and may change as required. Team Size: <u>Two</u> Students maximum																	

Robot Hockey Game

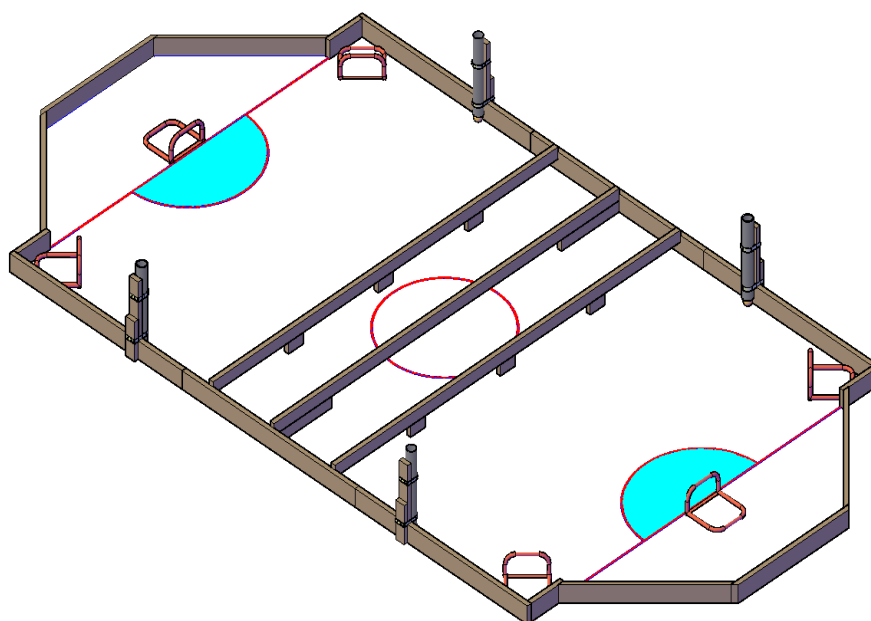


Figure 1: Overall Court



2023 Provincial Skills Canada Competition



Table of Contents

Purpose of the Challenge:	4
Mission Statement:	4
Skills and Knowledge Applied:	4
Responsibility of Competitors:	4
Supplied by the Committee:	4
1. Definition of terms referenced in this document	4
2. The Robot Hockey Game Teleoperation Game Overview	5
3. Detailed Court Areas	5
3.1: Neutral Zone	5
Figure 2: Neutral Zone	6
3.2: Defensive Zone	6
Figure 3: Defensive Zone	7
3.3: Shooting pathways	7
Figure 4: Shooting pathways	8
3.4: Ball Dispenser	8
Figure 5: Ball dispenser	9
3.5: Goal Areas	9
Figure 6: Net placement	10
3.6: Driver Zones	10
Figure 7: Driving zones	11
3.7: Starting Zones	11
Figure 8: Starting zones	12
3.8: Game Pieces	12
Figure 9: Standard Net with Corrugated Plastic	13
3.9: Shooting Mechanisms	13
Figure 10: Curve Length Measuring Points	14
3.10: Additional Notes	14
4. Each Team's Exclusive Use Area is approximately 12 ft. by 12 ft.	15



2023 Provincial Skills Canada Competition



5. Each Team's Area includes:	15
5.1: Starting Area	15
Figure 11: Starting areas	16
5.2: Tele-op Area	16
Figure 12: Tele-op area	17
5.3: Autonomous Area	17
Figure 13: Autonomous area	17
6. Hockey Game Description	17
7. Scoring Summary	17
7.1: Opponent Zone Balls	18
7.2: Neutral Zone Balls	18
7.3: Tie-breaker	18
7.4: Match Record and Point Standings	18
8. Marking Sheet	20
9. Pit Area and Court Access	21
10. Game Play	21
11. Court Layout	22
12. The Robot(s) Restrictions	23
13. Start of the Game Robot Status	23
14. Overall Team Robot Entry Size	23
15. Power Sources / Management	24
Figure 14: Circuit Protection	24
16. Non-Electrical (Battery) Energy Sources	25
17. Recommended Robot Controllers	25
18. Pit Area	26
19. Overall Court Description:	26
20. Pre-inspection for Compliance with Safety and Design Rules	27
21. Intent and Spirit of the Game	28



22. Autonomous Competition Overview..... 29

Appendix A: Court Area Dimensions and Details 34

Appendix B: Autonomous Competition Court Area Dimensions and Details 39

..... 39



Purpose of the Challenge:

To create engineering projects to encourage individuals with different skill sets to form con-operative teams to design, fabricate and operate a robot or multiple robots.

Mission Statement:

The intent of the challenge is to have teams of students independently designing, fabricating, and operating robots capable of completing the competition 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.

Skills and Knowledge Applied:

- Drafting
- Mechanics
- Electronics
- Computer Programming
- Metalwork
- Woodworking
- Communications

Responsibility of Competitors:

- Robots – Robot accessories (including batteries, battery charger, spare parts, hockey blade)
- Various tools required to modify and repair robots onsite
- Safety equipment including Mandatory Eye Protection
- Extension cord and power bar
- Wiring Diagram
- Easily accessible fuses
- Easily accessible emergency-stop switch(s)
- Robot Stand (the stand must allow robot motors to spin without moving the robot)
- Teams will provide their own Laptop(s)

Supplied by the Committee:

- Exclusive use Playing Fields for each Team's Game and Evaluated Robot Experiences.
- One worktable with access to a 120V power outlet (minimum 100W) per team
- A Component's Collection providing mechanical / electrical / control hardware to the Provincial winner that is required for the 'Built On-site Autonomous Robot Competition Element' at the National Event.

1. Definition of terms referenced in this document

- a. Tele-Operated Robot Elements are elements under the direct/active control of competitors during game play using one or two radios/game controllers held by the courtside competitors.
- b. Mobile Independent Autonomous Mobile Robot Elements are elements that at the start of a game have a competitor pressing their start button or enter on a computer keyboard as the only "Competitor" to "Independent Autonomous Mobile Robot Element" communication during the entire game.



2023 Provincial Skills Canada Competition



- c. Stationary Independent Autonomous Elements are elements that have their power on at the start of games but have no direct contact with a competitor during game play. These units may interact with the team's tele-operated mobile robot with the actions of the tele-operated mobile robot triggering an active response by the Independent Autonomous Element which may be managed either by a mechanical based system (eg. A series of limit switches / no programmed elements) or a pre- programmed system (eg. Managed by an Arduino or other microprocessor) internal to the Independent Autonomous Element.

2. The Robot Hockey Game Teleoperation Game Overview

- a. The core game situation requires a Robot or Robots to use the components provided in their Exclusive Use Court Space to (a) retrieve the hockey balls from their dispenser and (b) "shoot" the ball into the other team's net, while also trying to prevent the other team from "shooting" the ball into your own net.
- b. The goal of this game is to shoot the balls into your opponent's nets!

3. Detailed Court Areas

3.1: Neutral Zone

- a) The center court area consists of 2 sections, divided in the middle of the overall court.
 - a. These areas are 24 inches (2 feet) in width, and 144 inches (12 feet) in length.
 - b. These areas are separated by a barrier wall, which is composed of two 2x4s on top of each other, with the bottom one having an 8 ft long gap in the middle.
- b) These areas are separated from the team's defensive zone by a barrier wall, which is composed of two 2x4s on top of each other, with the bottom one having four 31.5 inch gaps evenly distributed along the length of the barrier.
- c) Each team will have one section of the Neutral Zone, which is on their half of the court.
 - a. Teams may have a single Autonomous robot operating in their Neutral zone.
 - b. No tele-operated robots are permitted in the Neutral Zone.

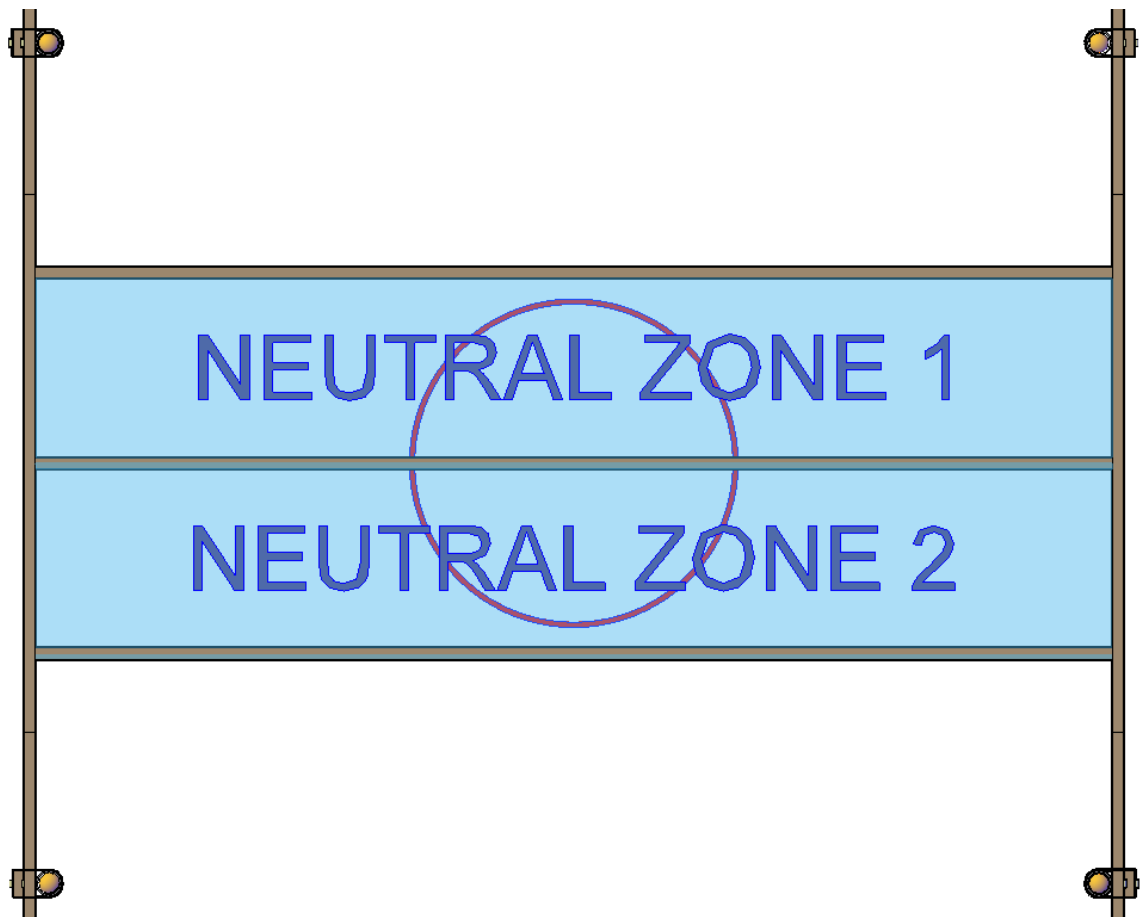


Figure 2: Neutral Zone

3.2: Defensive Zone

- a) The end areas of the overall court are defined as the “Defensive Zone”.
- b) The Defensive Zone ranges from the Neutral zone barrier to the end of the court.
 - a. The defensive zone consists of a rectangular area (between the goal line and the blue line) and a trapezoidal area (behind the goal line).
 - b. The defensive zone rectangular area measures 144 x 80.25 inches.
 - c. The defensive zone trapezoidal area measures 36 inches (goal line to back wall), with the goal line side being 120 inches and the back wall side being 48 inches.
- c) Contained within each Defensive Zone:
 - a. 3 nets



- b. 2 ball dispensers
- d) Each team can operate up to 2 Tele-operated robots in their defensive zone.
 - a. Teams have exclusive use of their defensive area.
 - b. Teams are not allowed to move any of the set game pieces (the nets).
- e) The goal is to shoot balls from your own defensive zone into your opponent's zone (and nets).

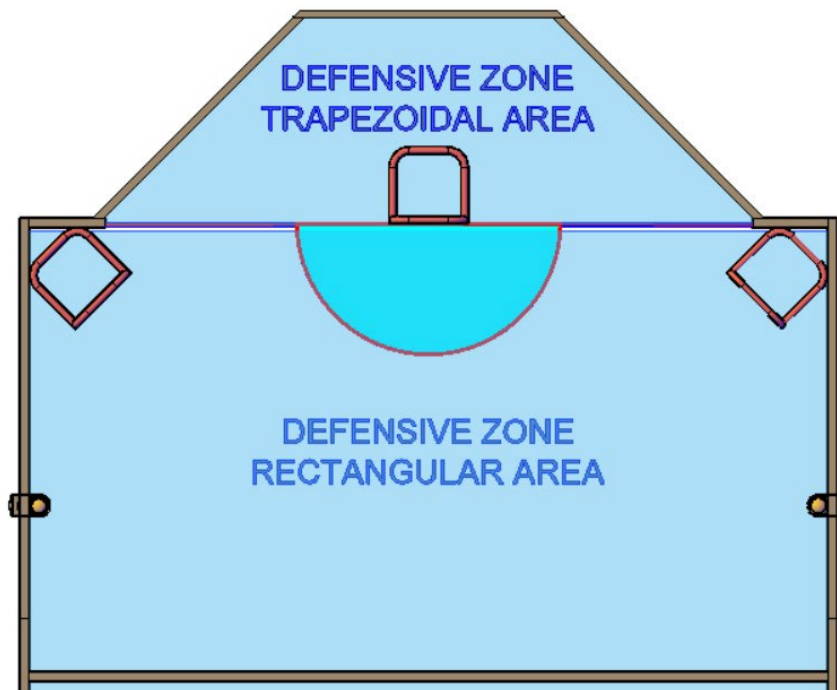


Figure 3: Defensive Zone

3.3: Shooting pathways

- a) When a team shoots the ball, it must be shot from their own zone.
 - a. Tele-op robots must shoot from their defensive zone.
 - b. Autonomous robots are allowed to shoot from their respective neutral zone.
- b) The shot must go through the shooting pathways
 - a. These shooting pathways are cut out sections of the barriers between zones.
 - b. These cut out sections are on the court floor.
 - c. The balls must not go over the barriers.
- c) There is one shooting pathway through the “Center line” barrier.



- a. It is 8 feet wide and centered along the “Center line”.
- d) There are 4 shooting pathways through the “Blue line” barriers.
 - a. Each opening is 31.5 inches wide.
 - b. There is a 6 inch space between the open pathways.

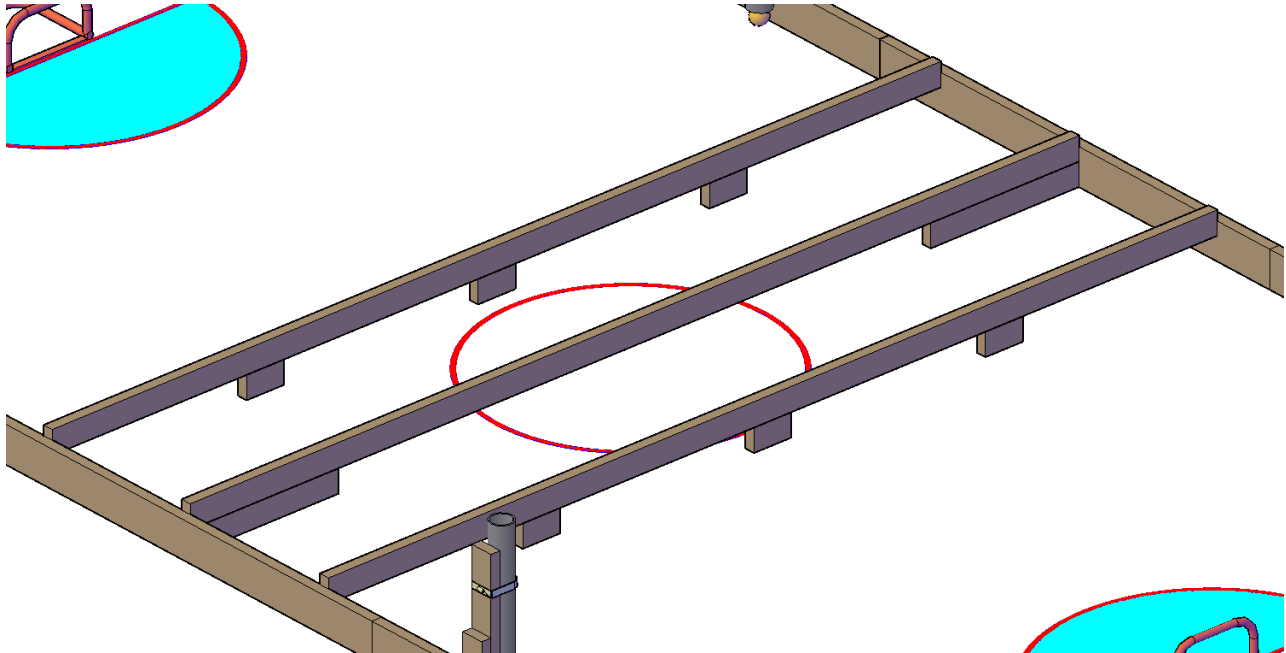


Figure 4: Shooting pathways

3.4: Ball Dispenser

- a) Located along the side exterior walls are 2 ball dispensers.
- b) They are located 30 inches from the edge of the “Neutral Zone” barrier to the center of the “Ball Dispenser” in the “Rectangular Defensive Zone” along the exterior walls (one dispenser on each side of the court).
- c) Ball dispensers are constructed of 3 inch (inner diameter) pipe.
 - a. The pipe is held 2.5 inches off the court floor surface.
 - b. The pipe will be held in place vertically, at 90 degrees to the court floor.
 - c. The pipe will be secured to a standing 2x4 with pipe clamps, as depicted in the court construction information (see appendix).

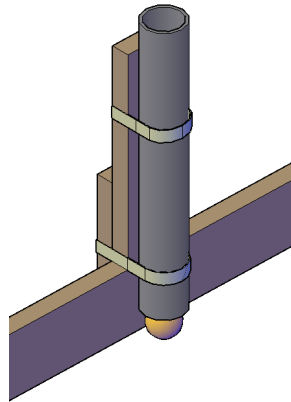


Figure 5: Ball dispenser

3.5: Goal Areas

- a) Each Defensive Zone will have 3 miniature hockey nets.
- b) The nets are “Franklin Sports Mini Skills Street Hockey Goal - Outdoor + Indoor Steel Mini Hockey Net” available [here](#).



- c) Each net is located in a set place, not to be moved by any robot operation.
 - a. One net is placed along the goal line, with its goal line lining up with the court’s goal line, in the middle of the court (width wise).
 - b. The other 2 nets are placed in each corner area, at a 45 degree angle, directly against the walls.
 - c. Refer to diagram for placement:

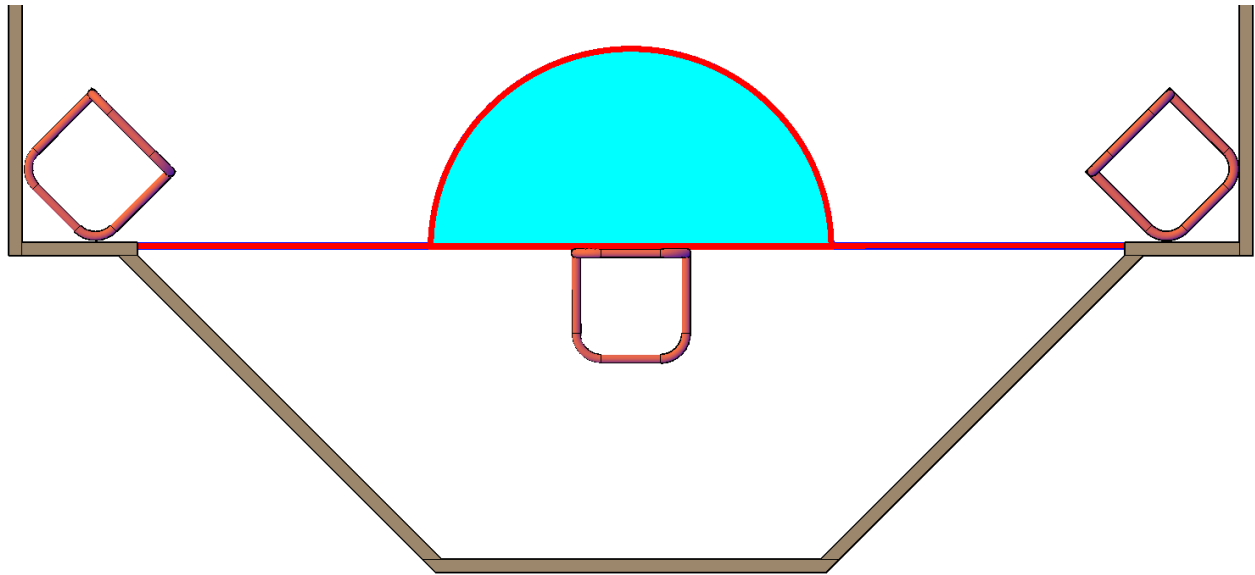


Figure 6: Net placement

- d) Each net will be equipped with a “goal line”, which will determine if a ball is considered within the net.
 - a. At no point are teams allowed to remove balls from inside of the net.
 - b. A ball is considered in the net if:
 - i. It is completely within the net. This is defined as the ball being located completely within the net and not breaking the vertical plane of the inside of the goal line.
- Or
- ii. It is touching the court floor within the net.
 - iii. NOTE: If a ball is not completely within the net and not touching the court floor inside of the net, it does not count as being in the net.

3.6: Driver Zones

- a) Each competitor must remain within their driving area for the duration of the game.
 - i) Teams will be able to select which competitor occupies which driver zone.
- b) Driver zones are in the triangular sections at the end of the court alongside their “Defensive Zone”.
- c) Driver zones will include an exterior barrier to ensure drivers remain within their appropriate areas.
 - i) Only 2 competitors per team are permitted to compete during a game.
 - ii) Teams with competitors operating in a non-driver role may allow one competitor to occupy

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11 | Last Updated November 10, 2022

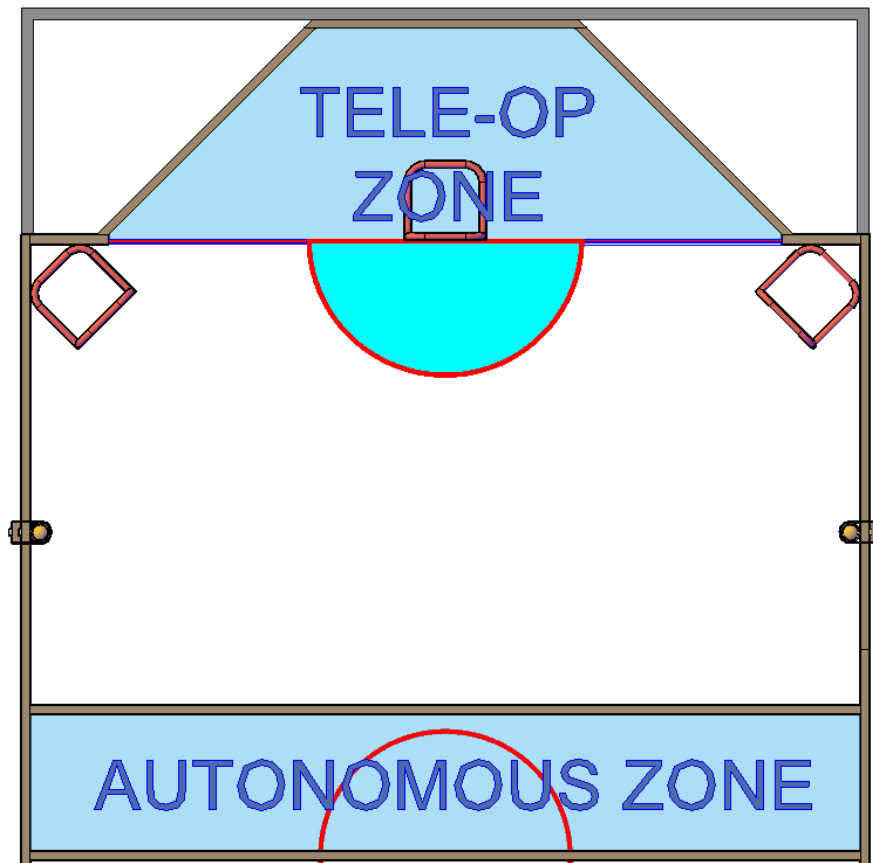


Figure 8: Starting zones

3.8: Game Pieces

- a) The miniature hockey nets are as follows:
 - i) The nets are “Franklin Sports Mini Skills Street Hockey Goal - Outdoor + Indoor Steel Mini Hockey Net” available [here](#).



- ii) Each net will be equipped with a “goal line”. This “goal line” will determine if a ball is



considered in the net.

- 1) The goal line will be a 1 inch wide strip of 4mm corrugated plastic, extending across the opening of the net (from the bottom of each post).

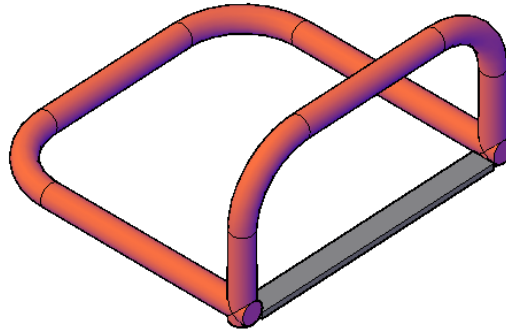


Figure 9: Standard Net with Corrugated Plastic

- b) The hockey balls are as follows:
 - i) “Franklin Sports NHL Street Hockey Balls - No Bounce Outdoor Street + Roller Hockey Balls - Official Size” available [here](#).
 - ii) They are officially sized at 2 5/8 inches in diameter.
- c) The hockey balls will start in the ball dispensers located on the exterior wall in the Defensive area.
 - i) Each dispenser will contain 10 hockey balls at the start of the game. This means teams will start with 20 total hockey balls on their side of the court.
- d) Hockey balls are not to be intentionally removed from the court or directed over a barrier.
 - i) Doing so could result in disqualification from the game.
 - ii) This includes shooting a ball over the middle barriers, or purposefully removing them from the court.

3.9: Shooting Mechanisms

- a) Robots must use the following hockey blade for their shooting mechanism:
 - i) Plastic road/street hockey blade with the maximum blade dimensions:
 - 1) The blade shall not exceed 12 1/2 inches in blade surface length, 3 inches in height, and 3/4 inches in thickness.

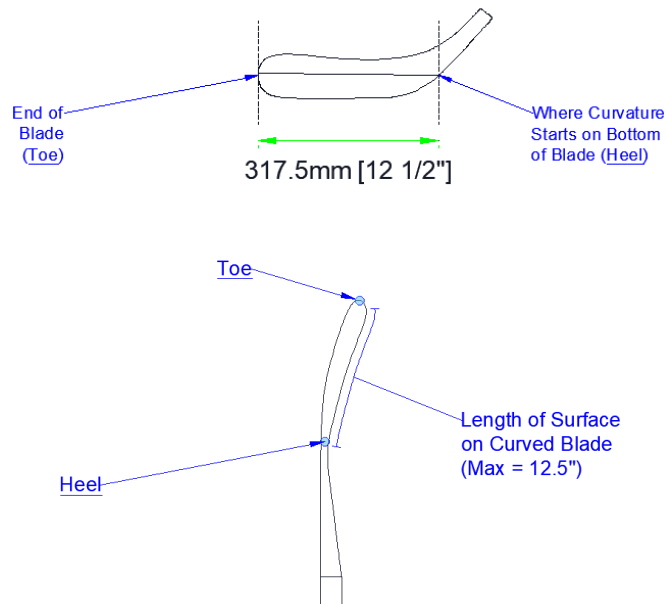


Figure 10: Curve Length Measuring Points

- b) The hockey blade is the only surface from which a ball is allowed to be purposefully shot.
 - i) The shooting mechanism **must use the blade of the “stick” to shoot the ball.**
 - ii) Pushing or shooting the ball intentionally with other parts of the robot are not permitted.
 - iii) Balls bouncing off a robot will be allowed, as long as they are legal.
 - iv) This includes any autonomous robot in use for the main game.
- c) Allowable modifications to the blade:
 - i) Curving the blade is permitted.
 - ii) Blades may be cut down to smaller size.
 - iii) Blades are not permitted to be extended beyond the original blade size.
 - iv) Blades are not permitted to have protrusions out of the “blade surface”.
- d) A maximum of one blade is permitted per robot (autonomous included).
 - i) The hockey blade itself is not counted toward the overall volume of the robot, but the mounting hardware is counted toward the overall volume.

3.10: Additional Notes

- a) At no time is a robot permitted to intentionally remove a hockey ball from play.
 - i) Teams are not to intentionally put a ball out of the court space.
 - ii) Doing so could result in disqualification.
- b) At no point is a team permitted to break the vertical plane of the shared middle wall.



- c) At no point is any robot permitted to intentionally reach over the exterior walls or zone barriers.
- d) At no point is a team permitted to shoot a hockey ball over the barriers.
 - i) This will be treated as the same as intentionally removing a ball from the court.
- e) At no point is a team permitted to purposely drop pieces off of their robot.
- f) At no point in time are robots permitted to be on top of any net. This is defined as:
 - i) Touching the top of the net in any form will be considered being on top of the net.
 - ii) The top of the net is bound by the external vertical plane of all sides of the net.
- g) At no point in time are robots permitted to be inside of any net. This is defined as:
 - i) Breaking the vertical plane of the exterior edge of the front of the net.

4. Each Team's Exclusive Use Area is approximately 12 ft. by 12 ft.

- a. Team members (max 2) must remain in the assigned driver area throughout the game.
- b. Additional team members are not allowed to communicate with the drivers or be within 5 feet of the court area.
- c. It is a Team Responsibility to define the tasks assigned to each competitor.
- d. If a Team has a Two Robot Entry, then:
 - i. Both competitors can be Robot Drivers
 - ii. Both competitors can also be Spotters for their partner driver
- e. If a Team has a One Robot Entry, then:
 - i. One competitor can be the Robot Driver and One competitor can be a Spotter for their partner driver

5. Each Team's Area includes:

5.1: Starting Area

- a) Robots must start in their designated starting areas. They must not break the vertical plane as defined by their barriers.
- b) Tele-operated robots will start in their Defensive Zone Trapezoidal area (behind the goal line). The goal line will be the barrier forming the vertical plane.
- c) Autonomous robots will start in their Neutral Zone, within the "Center ice" circle.

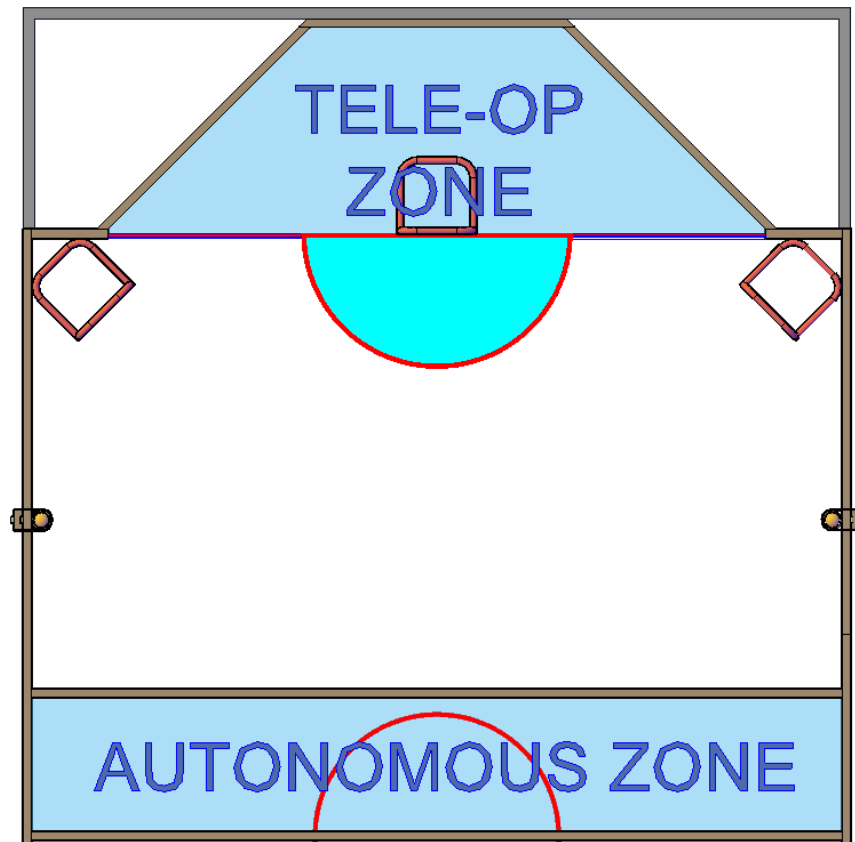


Figure 11: Starting areas

5.2: Tele-op Area

- a) Tele-operated robots will have free use of their entire Defensive Zone.
- b) Within this area are 3 nets, and 2 ball dispensers.
- c) Tele-operated robots must remain in this area at all times during the game.

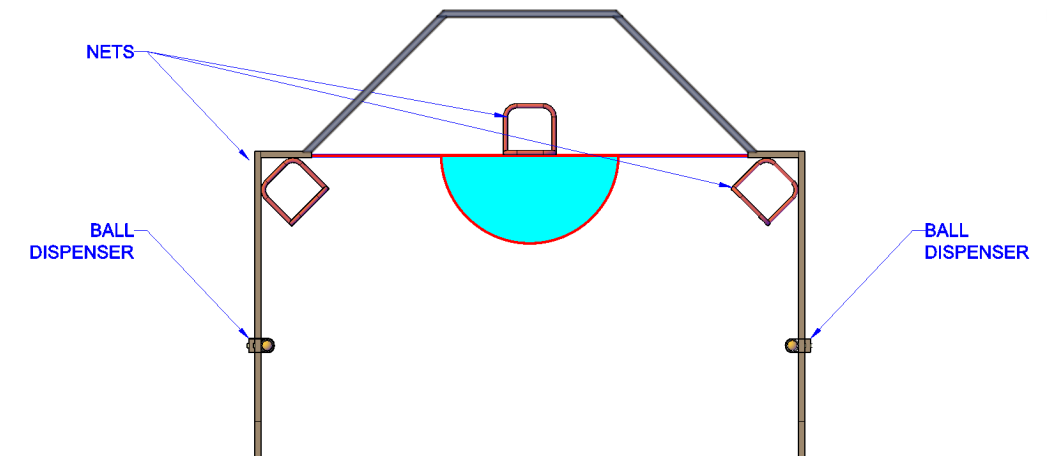


Figure 12: Tele-op area

5.3: Autonomous Area

- a) Autonomous robots will be able to use their team's entire Neutral Zone.
- b) Autonomous robots must remain in this area at all times during the game.

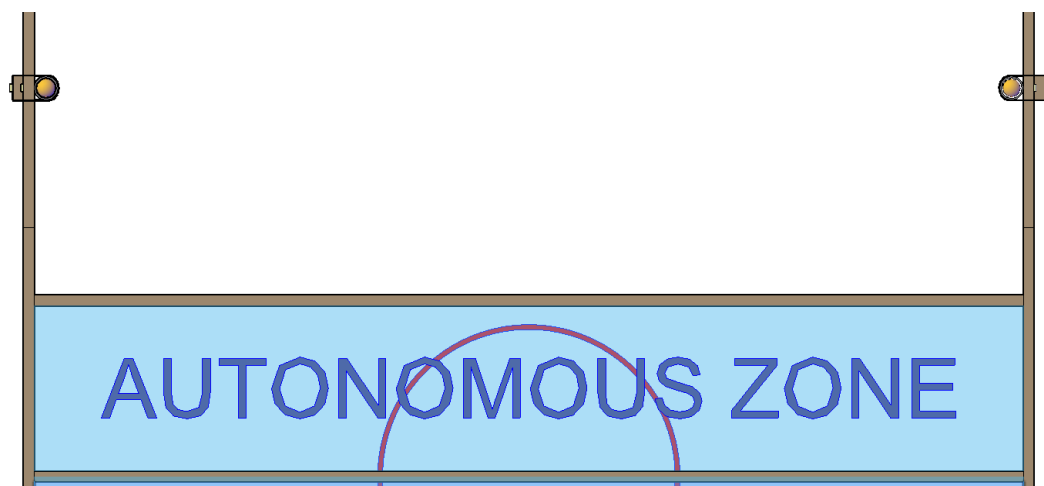


Figure 13: Autonomous area

6. Hockey Game Description

- a. Games will involve Two Teams at a time.
- b. Both Competitors are to remain in the assigned driver area.
- c. Teams can utilize a Maximum of TWO Tele-operated Robots.
- d. Teams may also use ONE Independent Autonomous Element as part of their entry (which must fit into the overall size limitation at the beginning of the game).
 - This autonomous element may be turned on prior to the match beginning.
- e. Teams may not use any other Independent Elements as part of their entry.
- f. Robots may NOT be in possession of any Hockey balls at the Start of a game.
- g. **Note:** Competitors will participate in BOTH the Hockey Game and the Built On-site Autonomous Robot Tasks during BOTH Competition Days.

7. Scoring Summary



Scoring will be done at the end of each 4 min. match:

7.1: Opponent Zone Balls

- a) Teams will earn 1 (one) point for every ball in their opponents Defensive Zone at the end of the 4 minute match.
- b) Teams will earn 2 (two) additional points for every ball scored into their opponent's nets.
 - i) A ball is considered in the net if:
 - 1) It is completely within the net. This is defined as not breaking the vertical plane created by the inside edge of the goal line. This includes balls captured by the net, but not necessarily on the ground.
 - Or
 - 2) It is touching the court floor within the net.
- c) Scoring will take place based on where the balls are at the end of the 4 minute match.

7.2: Neutral Zone Balls

- a) Balls in the Neutral zone at the end of the match are worth zero points.
- b) Balls in the Neutral zone will come into play in the event of a "tie" score after counting the "Opponent Zone Balls".

7.3: Tie-breaker

- a) All games will have a winner. There will be no ties for any games.
- b) In the event of an equal score based on the "Opponent Zone Balls" and "Opponent Net Balls", the following tie-breaker(s) will take place:
 - i) Balls will be counted in both teams' Neutral Zone. The team with the least balls in their own Neutral Zone will be declared the winner.
 - ii) Should the teams still be in a tie, a "Shootout" will occur. Each team will take one single shot from their own crease area. The highest scoring ball determines the winner.
 - 1) Should the teams both score an equal value on their first shot, they will take another shot, cycling their tele-op robots. This continues until a winner is determined.
 - 2) Only the shooting tele-op robot will be permitted on the court during this time.

7.4: Match Record and Point Standings

- a) Teams will be ranked based on their overall game record.
 - i) Wins will be awarded 2 points.
 - ii) Tie-breaker losses will be awarded 1 point.
 - iii) Regulation losses will be awarded 0 points.
- b) The Round-Robin rankings will be used to rank teams in order, and then placed into a seeded double knockout format playoffs.
 - i) Should teams have equal points after the round robin, the following tie-breakers will be used,



in order:

- 1) Overall wins.
- 2) Record against other tied teams.
- 3) Tie-breaking Shootout



2023 Provincial Skills Canada Competition



8. Marking Sheet

2023 Skills Canada - Mobile Robotics - Winnipeg				
Hockey Game Scoresheet				
Game Number:	Team A:		Team B:	
	Count	Score	Count	Score
Balls in opponents court (1 pt each):				
Balls in opponents nets (2 pts each):				
Total Score:				
Tie-breaker (if needed)				
Balls in opponents Neutral Zone				
Shootout (if needed)				
Shot 1:				
Shot 2:				
Shot 3:				
Shot 4:				
Shot 5:				
Winner:				
Tie-breaker loss?				



2023 Provincial Skills Canada Competition



9. Pit Area and Court Access

- a. 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).
- b. Teams **MUST** bring their Robots into the skill area at Orientation. Teams **ARE** allowed to remove their robots from the skill area during the over-night periods between Orientation Day, Competition Day 1, and Competition Day 2 of the contest.
- c. Laptops may be removed overnight by competitors.
- d. The pit area and contest court may be available to teams to work or practice during lunch breaks if an NTC committee member is present.

10. Game Play

- a. Teams may participate in a 'Round Robin Tournament' leading to a 'Seeded Double Elimination Playoff Tournament'.
- b. Hockey Game Tournament Standing will be based on the total number wins in all games played by each team.
- c. Teams will play a balanced number of Tournament Games.
- d. Teams will participate in an equal number of Games in the Round Robin Tournament.
- e. There may be Hockey Playoff Games.
- f. Tournament games will last 4 minutes.
- g. Tie-breaker procedure for all games will follow the method described above in the scoring section. There will be no tie games.
- h. 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 tournament.
- i. Between tournament games, battery changes and repairs to robots may be completed at the team's assigned Pit Area Worktable.
- j. During the competition, protective safety glasses are expected to be worn while performing material removal tasks (cutting, drilling, etc.).
- k. During game play, referees will have ultimate authority over game rulings, and will have full authority over team conduct in the court area.



2023 Provincial Skills Canada Competition



- l. No aerial (flying) robots are allowed.
- m. Damaging the court area is prohibited. If a robot's design causes damage to the court elements*, then 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 involves BREAKING court components. Robots bumping into court components and causing them to shift position without breaking any court element will NOT be viewed as 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.
- n. Games will start on time. Teams are responsible to know when their games are scheduled. Teams arriving late will be allowed to use the remainder of the time in the game. Competitors cannot enter onto the court surface or adjust their robot during a game.
- o. If a robot is mal-functioning and represents a hazard to participants, other robots or itself in the opinion of the Referee, then, the referee may stop the clock, and may authorize the shutting off the robot 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.
- p. It is a Team Decision what roles team members will fill. Drivers are the competitors holding the robot controller(s) and asserting direct control over a Tele-operated robot.
- q. The Spotter would be the competitor providing navigational guidance to the driver.
- r. Competitors may change roles while a game is in progress.
- s. Competitors (Driver/s and/or Spotters) must remain in their assigned area throughout the game.
- t. Competitors may not enter an opponent team's Assigned Courtside Team Area at any time during game play.
- u. At the start of a game, robots are expected to be in their Designated Starting Position.
- v. Robots arriving AFTER a game has started will be allowed to enter the game and use the Time remaining in the 4 min. game.
- w. Robots must not leave the contest court at any time during a game.
- x. It will be a referee's ruling that decides if an 'End of the Game Component Placement' took place before or after the game-ending buzzer sounded.
- y. If a Hockey ball falls out of the court, it may not be retrieved and will be considered out of the game for the remainder of the game time.
- z. Scoring will take place after the End of the Game Buzzer

11. Court Layout

- a. 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 inch tolerance.

- i. The open court surface will consist of the good side of Plywood Sheets **OR** the facility floor **OR** the smooth side of Masonite Sheeting.
- ii. Detailed court information has been included in the Appendix Section of this document.

12. The Robot(s) Restrictions

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

13. Start of the Game Robot Status

- a. 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:
 - i. Robots must be stationary.
- b. Robots must be in their designated Starting Location.
- c. If Team Entries involve multiple Robots / Mechanisms, then all of them must fit within their starting locations and must be positioned to not exceed the allowed total 4 cubic feet volume per Team, as described in Section 14.
- d. All systems may be ON.
- e. Air System Circuits may be fully charged to 100 PSI and their compressors can be ON.

14. Overall Team Robot Entry Size

- a. Complete Team Entries must fit within the designated starting area at the start of each game, as defined by the vertical plane of the starting area.
- b. Complete Team Entries must not exceed an overall size of 4 cubic feet (6912 cubic inches) at the start of each game.
- c. Team Entries may expand to a larger size once a game has started.
- d. Team Entries may start in 2 parts:
 - i. Tele-op robots must start together, and their total volume will be taken based on their overall starting position.



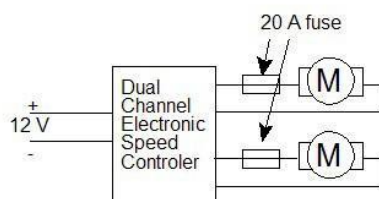
- ii. Autonomous robots must start in the autonomous starting zone. Their volume will be taken based on their starting position (defined as the starting position at the beginning of the tele-op match).
- iii. Total volume will be calculated by adding the total tele-op volume to the total autonomous volume, like this:

$$\text{Total Volume} = \text{Total Tele-op Volume} + \text{Total Autonomous Volume}$$

15. Power Sources / Management

- a. The total voltage in any individual circuit cannot exceed 24 Volts.
- b. The maximum continuous power rating allowed in any circuit branch is 240 W, which will be limited by voltage and fuse selection. A larger main fuse can be used to provide protection for motor controllers. To calculate power in any given circuit, use the following formula: Power (Watts) = Voltage (Volts) x Current (Amps)

Acceptable Circuit Protection: (ESC is NOT protected by fuse)



Recommended Circuit Protection: (ESC IS protected by fuse)

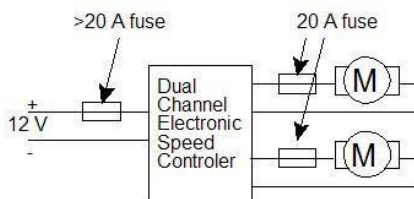


Figure 14: Circuit Protection

- c. 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.
- d. Each current branch path from the battery must include either an in-line fuse, resettable fuse, circuit breaker, or be connected to a dedicated fuse in a rack.



2023 Provincial Skills Canada Competition



- i. Devices with a known, dedicated internal fuse (based on manufacturer's documentation) are considered to have this requirement met, assuming the fuse rating is appropriate.
- e. Batteries must be complete sealed commercial battery packs.
 - i. Competitors must have the Material Safety Data Sheets for their batteries.
- f. ALL Robots must be able to be turned off with a single motion.
- g. Robot Controller receivers may be in an independent circuit.
- h. No explosive materials of any kind may be used (ether, gunpowder, acetylene etc.)

16. Non-Electrical (Battery) Energy Sources

- a. Pressure based energy sources (air or other) may be pre-charged to a maximum of 100-PSI pressure in their reservoirs (cylinders) at the start of each game.
- b. Air pressure systems using Competitor-made or modified air pressure hardware are NOT permitted.
- c. All pressurized tanks on robots must have a pressure gauge to indicate the stored pressure and a form of automatic overpressure safety relief system.
- d. The pressure tanks and related gauges / controls must be shielded from damage due to collisions or flying target objects.
- e. The stored pressure in the tank must not exceed a maximum of 100 PSI at any time.
- f. 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.
- g. Laser devices are prohibited.
- h. Hydraulic fluid systems are not permitted.

17. Recommended Robot Controllers

- a. It is recommended (not required) that all teams use 2.4 GHz "non-crystal" control systems on Tele-operated Robots.
- b. Teams are allowed the use of an unlimited number of channels, but only two separate tele-operated robots. Teams assume full responsibility if any interference is to occur with their respective communication systems that could render the robot(s) useless.
- c. Tele-operated Robots may not transmit audio/visual information to off the robot devices. (Ex: Having a camera transmit images real time to a computer near the driver, etc.)



2023 Provincial Skills Canada Competition



18. Pit Area

- a. Competitors **MUST** wear safety glasses when doing fabrication work involving material removal processes (grinding / cutting).
- b. Only registered competitors are permitted in the contest space.
- c. 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.
- d. Designated teacher/industry team advisors are not allowed in the pit area during tournament play.
- e. Teachers and industry advisors are not permitted to handle tools or robot parts. Students must affect all repairs and modifications on their robot.
- f. Teams will be provided with a 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.
- g. It is required that teams fabricate a tabletop stand for holding their robot(s) in the pit area. This stand or these stands should hold the robot(s) securely and be capable of preventing the robot(s) from driving on or off the table in the case of either deliberate motor testing during repairs or due to random, unexpected motor activity.

19. Overall Court Description:

- a. The Court Playing Surface will be a 12' by 24' area.
- b. Individual Exclusive Use Team Spaces are 12' by 12' areas.
- c. The Perimeter Court Walls will be made using 2 by 6-inch planks.
- d. This wall will as a result will be approximately 5.5 inches tall.
- e. The court surface may vary between melamine, concrete, hardboard, or plywood.



20. Pre-inspection for Compliance with Safety and Design Rules

- ☐ Mandatory Wiring Diagram provided.
- ☐ Tabletop Robot Stand
- ☐ Overall volume $\leq 4 \text{ ft}^3$ or 6912 in^3
- ☐ Hockey Blades meet restrictions
- ☐ 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
- ☐ Material Safety Data Sheets available for all batteries.
- ☐ Total voltage in any individual circuit does not exceed 24V
- ☐ No circuit **branch** exceeds 240W (Voltage x Fuse Current Rating, easily accessible)
- ☐ All circuits have a fuse or breaker (breakers must have **DC rating**) and all Fuses / Breakers must be readily accessible.
- ☐ Mandatory Pressure System Circuit Diagram provided.
- ☐ No Competitor-made or modified air pressure hardware being used.
- ☐ Only commercially manufactured Pressure Tanks (cylinders) can be used.
- ☐ Pressure indicator
- ☐ Pressure in tanks does not exceed 100 psi
- ☐ Over-pressure safety valve
- ☐ Pressure tanks and related gauges and controls are shielded from damage due to collisions
- ☐ **Robot can be turned off with a single motion.** Radio receivers / Logic circuits may be independent of the emergency-stop switch. This includes all tele-op and autonomous robots.
- ☐ Control unit to support operator to robot communication are being used.
- ☐ Demonstration of robot functionality

Additional concerns:

Robot Evaluator Signature

Team Representative Signature

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21. Intent and Spirit of the Game

Strategies aimed at preventing the opponent from playing the game are not permitted, as they are not in the spirit of fair play, and will not be permitted. Specifically, this means at no time is it acceptable to completely block the pathway holes in such a way that no balls are able to be shot through them.

In the same spirit of the game, completely blocking the mouth of the nets in such a way that no balls are able to pass through is not permitted. For example, sitting something in front of the mouth of the net blocking it completely will not be permitted. Also worth noting, this would be in violation of Section 6 (d) and in violation of the designated zones (as this would be considered an independent autonomous element). It is worth noting that robots are allowed to use defensive maneuvers to “block shots” from opponents.

Autonomous Elements during Teleoperated Gameplay

At no time is a robot permitted to intentionally drop pieces off of their robot. This includes autonomous robots, and also includes parts of the robot.

Included here are parts of the robot that remain somehow attached but are no longer fully supported by the robot’s structure.

For example: Dropping one “anchor” for the end of a net and driving the other end around while still attached to the robot, is not permitted.

Ball Handling

The hockey blade is the only surface which is permitted to intentionally shoot the ball - however a team corrals the ball is up to them.

In the case where a team is corralling a ball with intentional pushing movements, and it drifts over to the other team's side without being shot by the hockey blade, it will be ruled that violates the rules. Teams must be held responsible for their intentional movements, and therefore must be responsible for their corralling movements.

In the case where a ball is shot from the blade and unintentionally hits a robot and deflects from that robot, that would be considered not to be in violation.

The intent of the motion is key and if a robot is chasing a ball that is bouncing around and they do not hit it with their shooting surface it will not be a violation. If they are trying to actively control the ball and move it across the line without shooting it then it is not permitted.

Shooting Mechanisms

Teams are not permitted to use a different shooting mechanism to shoot the ball in the direction of the blade for the purpose of ricocheting the ball off the blade. That is not an acceptable shooting mechanism.

For clarification: the surface of the plastic hockey blade must directly impart kinetic energy to the hockey



ball which causes the ball to move in order for it to be classified as a shot. Any shooting mechanism which allows this transfer of energy will have a permitted shooting mechanism.

For example: A wheel based shooting mechanism which shoots the ball at the blade, causing it to ricochet off the blade is not permitted.

If you are not sure if your shooting mechanism is permitted, please reach out to the PTC.

Violations

If any rule violations are noted during the competition, the following escalation pathway will be followed:

During a match:

- 1) 1st Warning. In match warning when noticed.
- 2) 2nd Warning. In match when noticed, with the team clearly told the next occurrence is disqualification.
- 3) Disqualification of the match. The team will then be subjected to a discussion with the judges. The team will have to prove the violation is addressed before they are allowed to proceed in another match.

Not during a match (Practice time, inspection, or other):

- 1) Discussion with the team about the violation noticed with the judges.
- 2) Teams will not be permitted to proceed until the judges are convinced the violation is addressed.

Note: Depending on the severity of the violation, warnings may be skipped.

22. Autonomous Competition Overview

- The Secondary part of the Provincial Skills Competition involves the completion of an autonomous competition, separate from the teleoperated competition described above.
- Autonomous robots may occupy a total space no more than 2,744 cubic inches at the start of a task run.
- The court provides a 45 & $\frac{3}{4}$ inch by 93 inch hard, smooth white melamine surface with a 2 and $\frac{3}{4}$ inch perimeter, broken up into 2 sections.
- The goal of section 1 is for an autonomous robot to navigate a predetermined route through a tape maze.
- The goal of section 2 is for an autonomous robot to place foam objects into a loading dock. The target objects for section 2 are 2" square foam pieces, surrounded by 1 layer of standard red duct tape, situated at specific locations on the court within each section.
- The destination locations are the "loading zone" in section 2, and the "zone's" in section 1 that an autonomous robot platform must enter to achieve points.



2023 Provincial Skills Canada Competition



- The robot's starting position can be anywhere inside the "starting zone" for section 1, but the robot platform may protrude past as long as no part of the robot is touching the inside of the "dead zone". The starting position for section 2 can be anywhere that is not within the inner lines of the "loading zone". "Inside" is defined as anywhere within the dotted lines noted in Appendix B.
- Black electrical tape lines identify the foam piece positions and destination zones. For autonomous robots that utilize a line follower to orient themselves, a central black electrical tape line is used in section 1 to help guide robots to the finish zone.
- The autonomous court description can be found in Appendix B.
- Scoring is based on the following:
 1. Section 1 – "Tape Course" – 15 possible points – 2 minutes per attempt
 - a. 1 point for touching any location inside the electrical tape boundary for zone 1
 - b. 3 points for touching any location inside the electrical tape boundary for zone 2
 - c. 5 points for touching any location inside the electrical tape boundary for zone 3
 - d. 6 points for touching any location inside the electrical tape boundary for the Finish Zone. PLEASE NOTE – A robot must first have touched zones 1, 2, and 3 to achieve these final points.
 - e. If a robot at any point touches any location inside the electrical tape boundary of the dead zone, the team will be subtracted 5 points. PLEASE NOTE – a team will not go negative if they have less than 5 points to subtract in this case. They will just be deducted down to a minimum of 0 points.
 - f. While performing an attempt, a team must consecutively touch the previous sections in order to achieve the next zones' points.
 2. Section 2 "Loading Dock" – 15 possible points – 2 minutes per attempt
 - a. 1 point for placing a "middle" block into the loading zone, past the inside of the electrical tape boundary. **(Maximum 3 points)**
 - b. 2 points for placing an "edge" piece into the loading zone, past the inside of the electrical tape boundary. **(maximum 9 points)**
- Teams practice time will only be limited by the availability of the autonomous court. There will only be one autonomous court available at the provincial competition.
- Once a team is ready, they can signal to the judges that they wish to score this attempt for points. Once declared, teams are constrained to a 2 minute time limit per section. A judge must be present for the attempt in order to count as a scored attempt.



2023 Provincial Skills Canada Competition



- Teams are allowed to score 3 attempts per section. **Their best score for each section will be counted in their autonomous total. (6 attempts total)**
- A maximum of **30 points** are possible in the autonomous contest.
- Once a team scores 3 attempts per section, they will no longer be allowed to practice in that section of the autonomous court. This allows for other teams to get their chance to practice and score all attempts as well.
- If a team is happy with their score on a section after the first or second attempt, they are not obligated to score a further attempt.
- There will be NO PLAYOFFS in the autonomous competition. Final standing will be based on the total of the best score in each of the two tasks to a maximum of 30 points.

ADDITIONAL INFORMATION

Skills Canada Alberta Regional and Provincial Rules and Regulations

[Regional and Provincial Rules and Regulations](#)

Competitor Registration

Registration for Provincial Skills Canada Competition (PSCC) will open online on January 18, 2023 @ 8:30 AM. Please refer to this competitions event page for additional registration and competition information: <https://skillsalberta.com/competition/>

Lunch

Lunch for accredited competitors will be provided by Skills Canada Alberta. Teacher accreditation can be purchased online at: <https://skillsalberta.com/hospitality-access-pass>

Parking & Venue Maps: <http://edmontonexpocentre.com/attend/parking/>

Opening Ceremonies / Competitor Registration

Opening Ceremonies for the PSCC will take place on Tuesday May 2, 2023 at 6:00 pm in Hall D of the Edmonton EXPO Centre. Admission is free, and everyone is welcome to attend. It is important to note that competitor registration will open immediately following the Opening Ceremony.



Awards Ceremony

The Awards Ceremony will take place on Thursday May 4, 2023 at 6:30 pm in Hall D of the Edmonton EXPO Centre. Admission is free and everyone is welcome to attend. The Awards Ceremony will be shown live at <http://skillsalberta.com/>

Team Alberta Information

Team Alberta will be selected at the PSCC Awards Ceremony. Gold medalists will then be eligible to participate at the Skills Canada National Competition (SCNC) on May 24- 27, 2023 in Winnipeg MB. It is recommended that competitors review the SCNC contest description to be familiar with the national contest description and project at <http://www.skillsCanada.com/>.

During the PSCC Awards Ceremony on Thursday May 4, 2023 gold medalists will be given their Team Alberta information package and will confirm their participation in the SCNC. Students must be present at the Awards Ceremony to claim their position on Team Alberta. If the Gold medalist is not able to attend SCNC, the next top ranking individuals will be asked to participate. If a student is not able to attend the Awards Ceremony a letter confirming the student's interest in Team Alberta participation must be emailed to javierad@skillsalberta.com prior to the start of competition on May 3, 2023.

Please prepare your students in advance to accept a position on Team Alberta and outline how your school will support their participation. Furthermore, it is very important that all fieldtrip/travel information for potential Team AB members is organized and completed prior to the selection of Team AB.

Questions?

Please contact Kennedy Mayer at kennedym@skillsalberta.com if you have any questions regarding the Contest Description.

Further Communication

Questions for clarification of the rules can be made to your provincial technical committee member.



2023 Provincial Skills Canada Competition

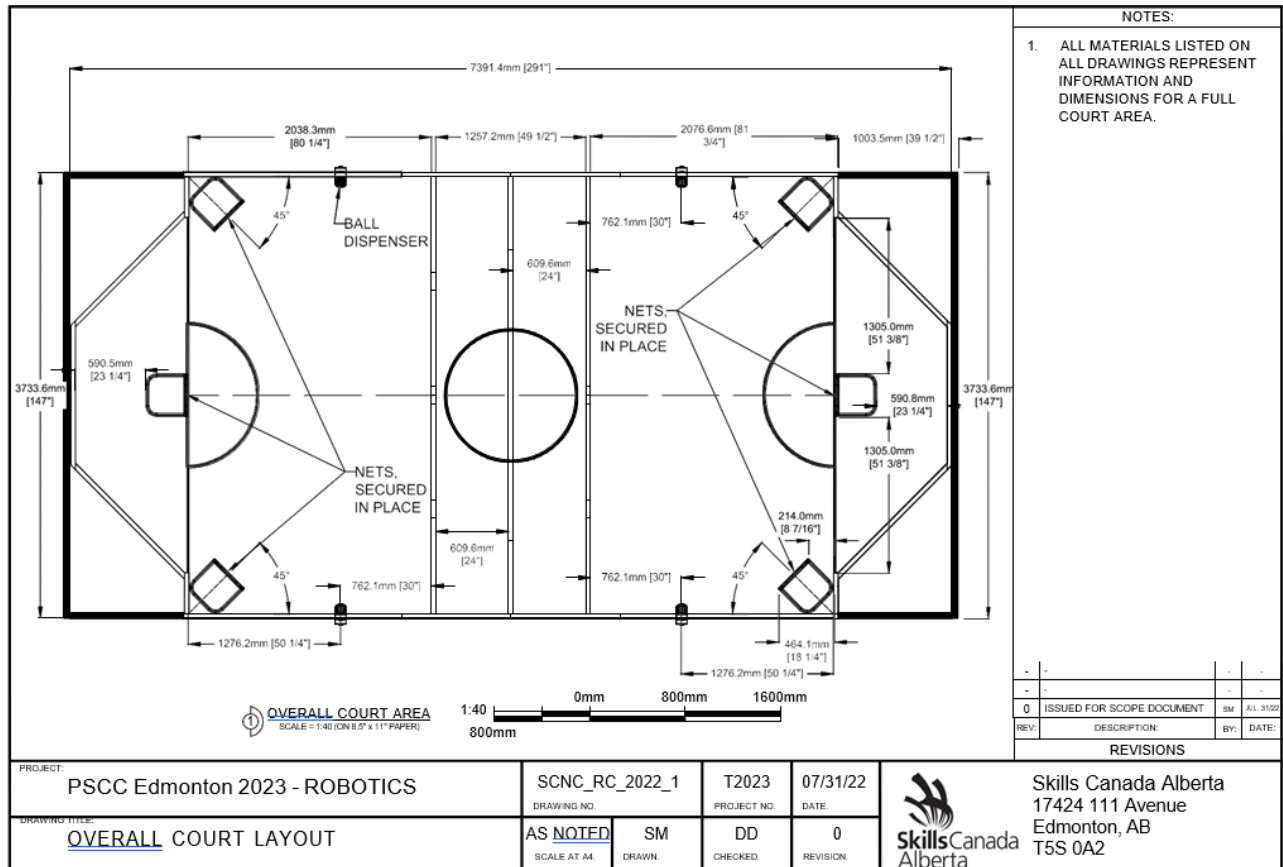




2023 Provincial Skills Competition

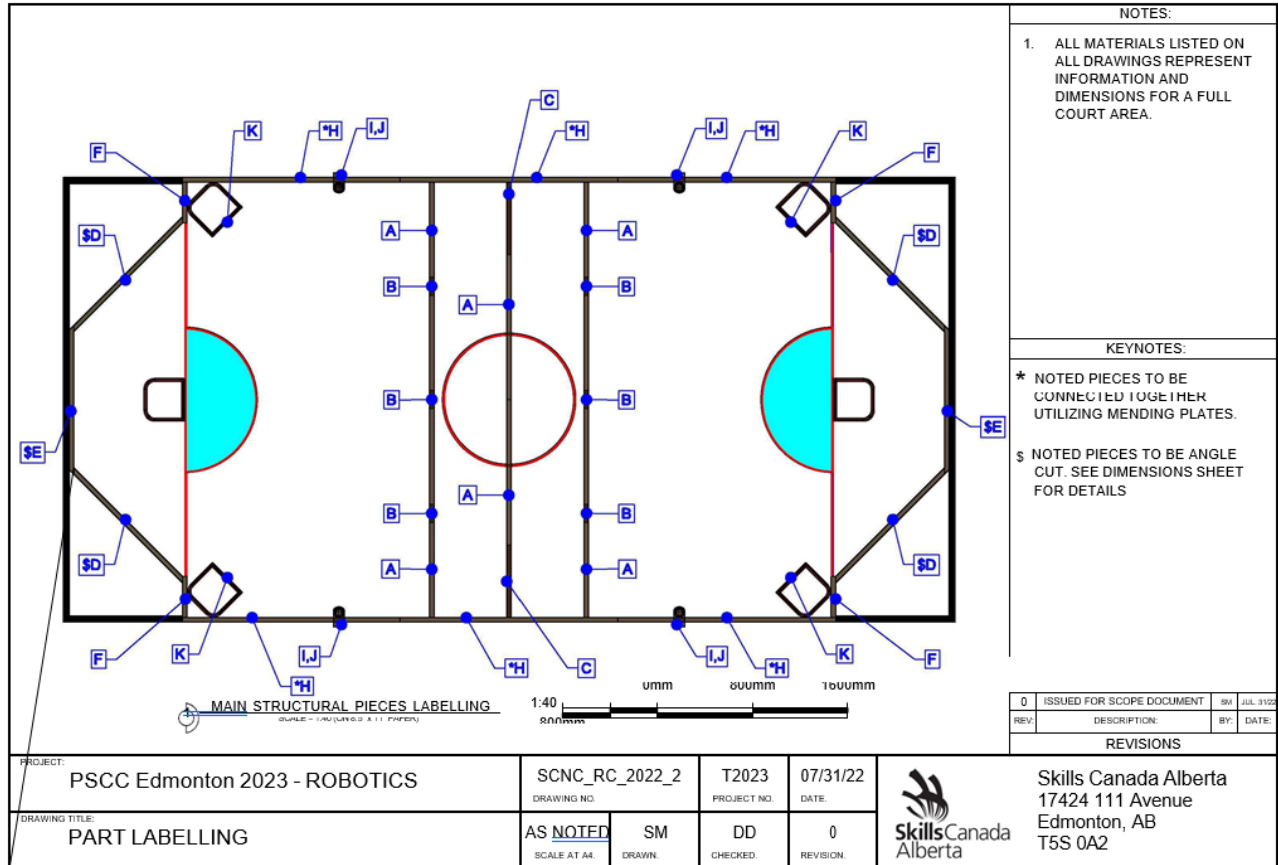


Appendix A: Court Area Dimensions and Details



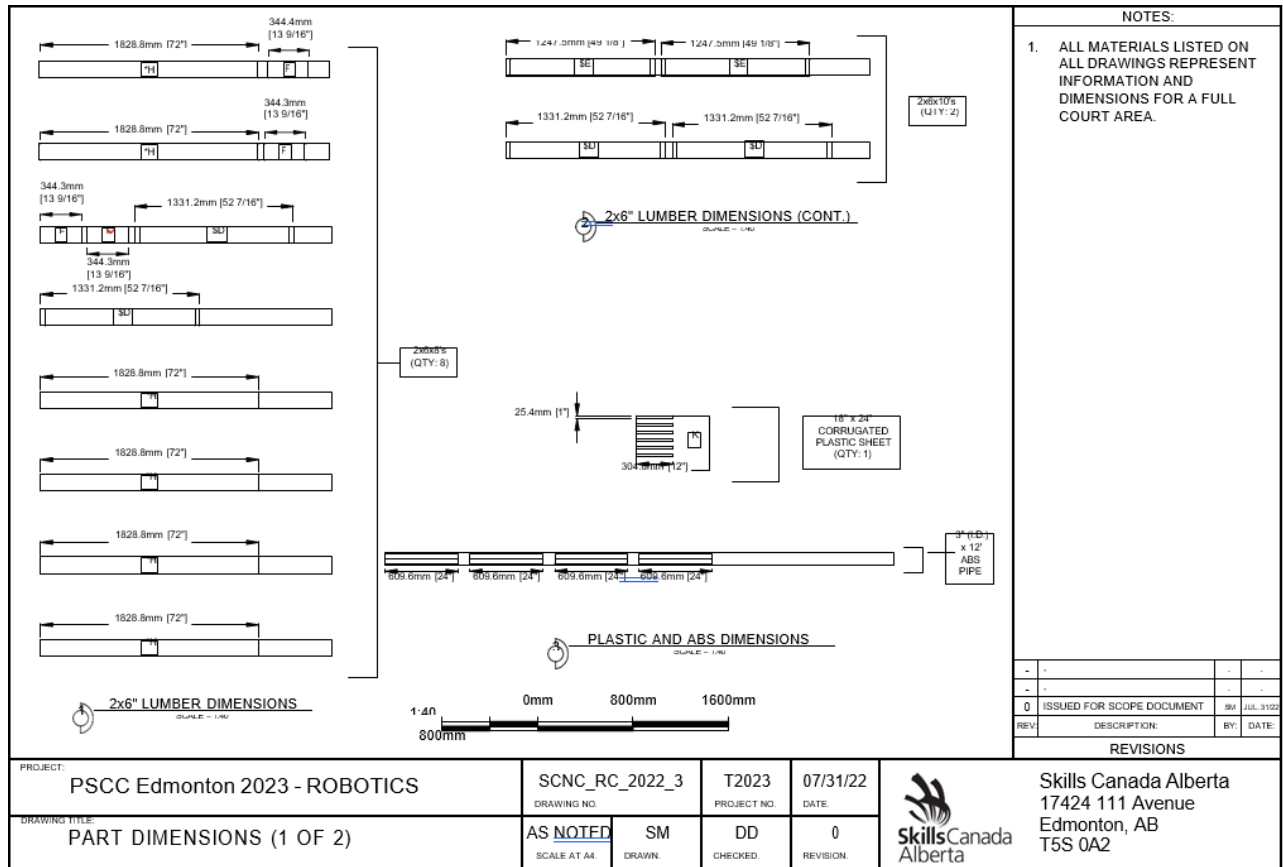


2023 Provincial Skills Canada Competition



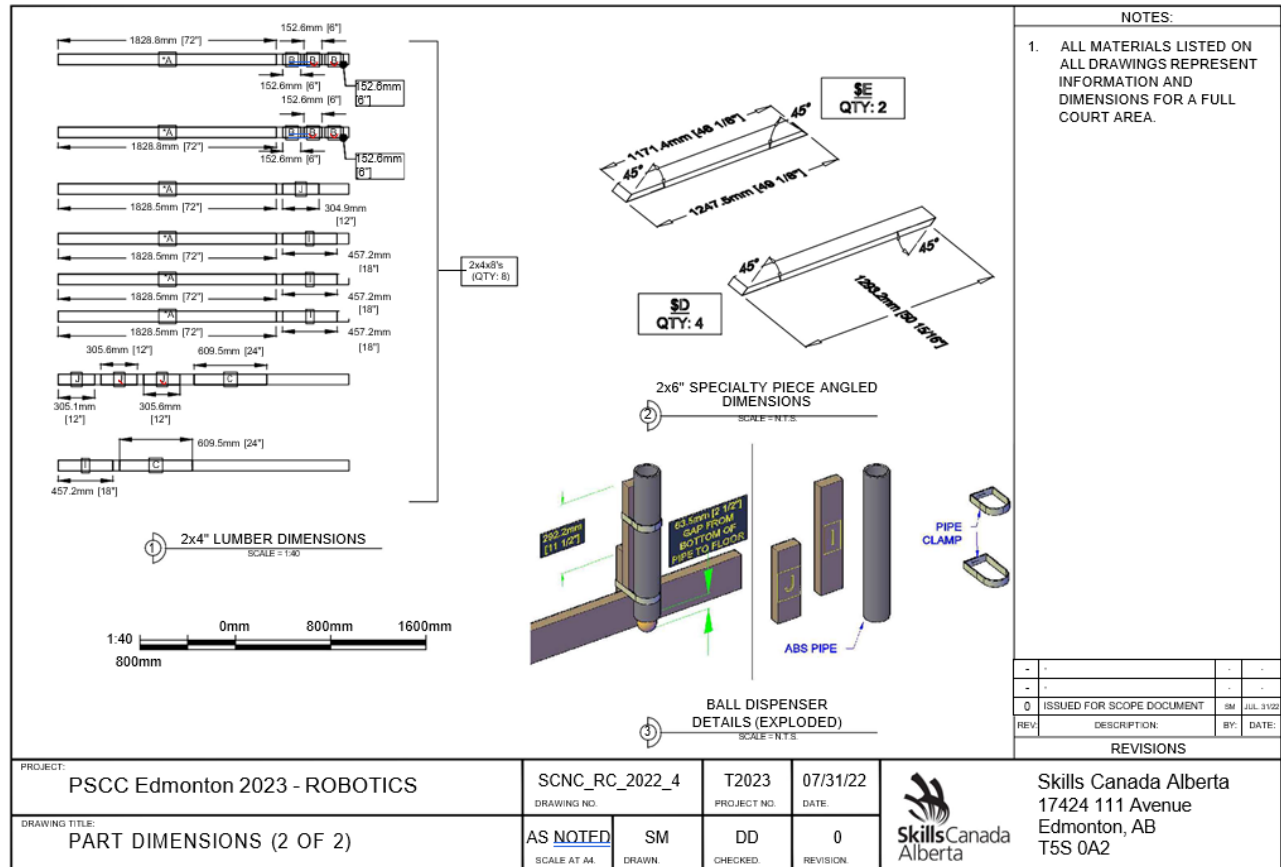


2023 Provincial Skills Canada Competition





2023 Provincial Skills Canada Competition





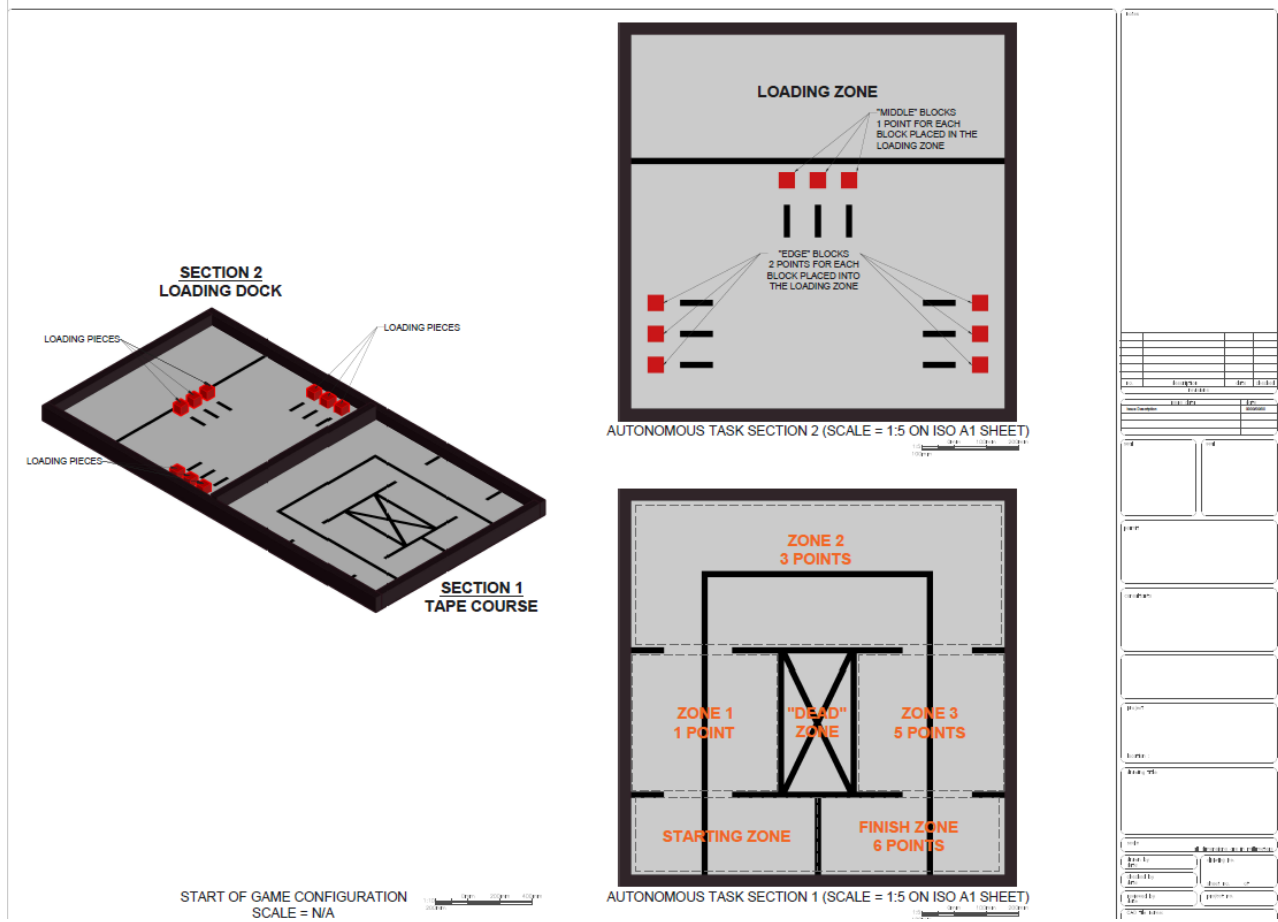
2023 Provincial Skills Canada Competition



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				1. ALL MATERIALS LISTED ON ALL DRAWINGS REPRESENT INFORMATION AND DIMENSIONS FOR A FULL COURT AREA.																																								
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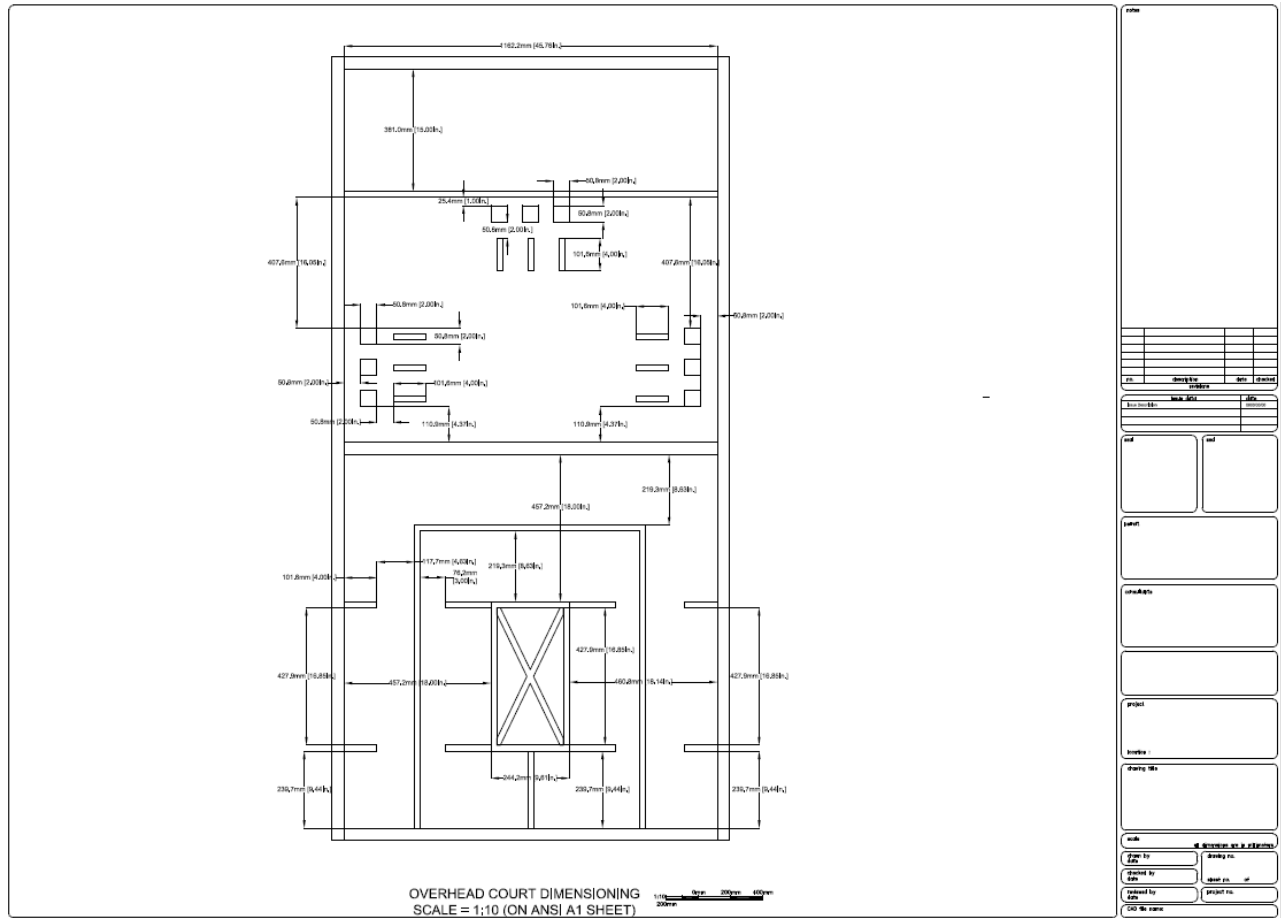


Appendix B: Autonomous Competition Court Area Dimensions and Details



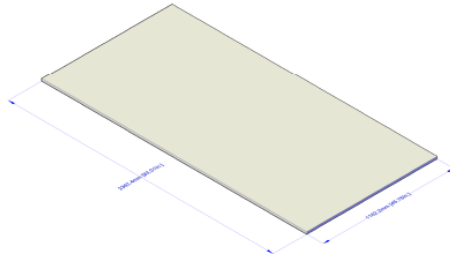


2023 Provincial Skills Canada Competition

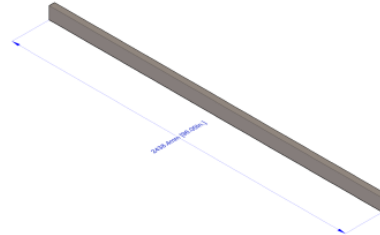




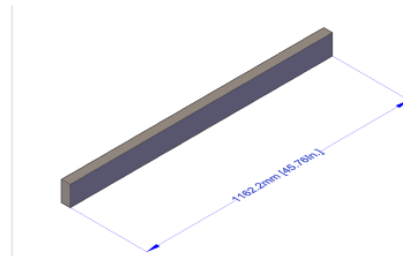
2023 Provincial Skills Canada Competition



MELAMINE COURT FLOOR (QUANTITY = 2) (1162.2mm x 2362.4mm x 19.1mm)



2x4 PERIMETER WALLS (QUANTITY = 4) - LENGTH = 96 in.



2x4 DIVIDER WALLS (QUANTITY = 6) - LENGTH = 45.76 in.

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