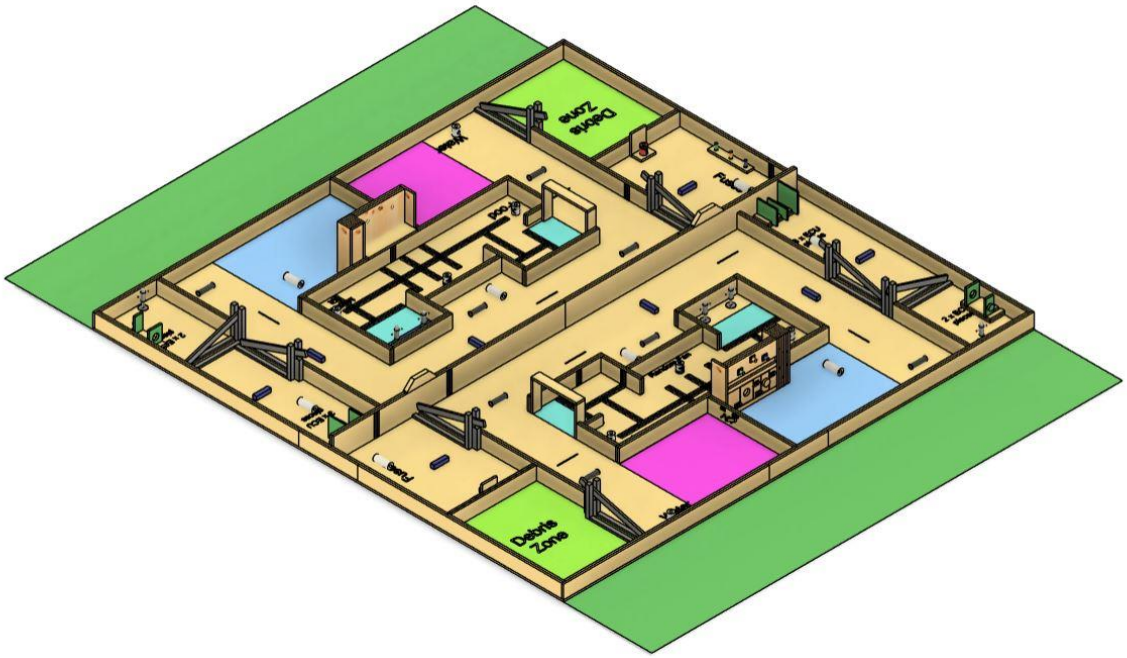
Skills British Columbia Compétition

Robotics

Secondary

Contest Scope
2026

Disaster Rescue



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Last updated September 12TH 2025

Please check the SkillsBC Website Competition Documents for the latest version or Q&A

GENERAL CONTEST INFORMATION

Technical Chair: Steve Claassen, Comox Valley Schools, steve.claassen@sd71.bc,ca

Any questions regarding this scope must be sent at least two weeks prior to the contest date to be guaranteed a response. Questions deemed potentially "game effecting for across the country" are then forwarded to the National Technical Committee to ne answered and then put in a national Q&A Document to be shared across the country.

Skills BC Competition Tournament Format

- Teams will participate in an equal number of Games in a Round Robin Tournament
- Tournament games will last 4 minutes.
- Only the top 8 teams move on to the playoffs.
- Teams will be given a schedule and must be on time for their games.
- Teams will be seeded in the double elimination playoff bracket according to their standing in the round robin. (1 vs 8, 2 vs 7…).
- Score sheets will be completed by the judge/referee and must be signed by representatives from both teams. Teams are responsible for ensuring the scoring is accurate before they sign the score sheet.
- Teams may have up to 4 competitors (But **ONLY 2** competitors at Nationals).

Competition Day Schedule

7:00am - Check-In (Teams set up)
7:30am - 8:30am - Robot Inspection
8:30am - 9:00am - Welcome and Referee Remarks
9:00am - 12:00pm - Round Robin
12:00pm - 12:30pm - Lunch
12:30pm - 2:30pm - Round Robin
2:30pm - 3:30pm - Playoffs
3:30pm - 4:00pm - Wrap Up

Additional Notes

- Competitors will be provided a worktable, chairs, and access to a 115v power source. Everything else is to be provided by the team including a support stand for their robot
- There will be an Autonomous Practice Court at the competition for competitors.
- All teams **MUST** wear eye protection while in the competition area.

FROM THE TECH CHAIR

Dear BC Robotics Community,

This game was developed by the Skills Canada National Technical Committee and it's theme this year is around Disaster Rescue. It is skills based and not a head-to-head competition where you interact with your opponent. Teams (consisting of a maximum of 2 teleoperated robots and one fully autonomous robot) will enter a building with their robot(s) and will need to clear debris, bring supplies to people trapped and restore services to the building.

Make sure to read this document carefully and watch the description video for an overview of the competition (Thanks Dan Kurz from Ontario). The main difference between the national scope and provincial scope is that there is NO Interview or separate Autonomous Challenge.

A Q&A document that will be updated regularly. It will be emailed to people that I know are looking to participate this year AND will be posted directly to where you found this scope document on the Skill BC Website and on the Nationals Skills Canada Website. The Q&A document supersedes the scope and should be monitored regularly. If you have a question that is not answered in the scope or a Q&A, there is a good chance someone else has the same question so please email your question directly to me steve.claassen@sd71.bc.ca and I will have it clarified. Questions deemed potentially "game effecting and/or of national interest" are forwarded to the National Technical Committee to be answered and then put in a national Q&A Document to be shared across the country. This is what is posted on the BC Site (usually once a month).

Teachers and Coaches: There needs to be a BC Robotics Technical Committee. If you are interested in being part of the committee that runs this contest, please reach out to me. If you are interested in starting a team, please contact me as I am happy to help with any questions about starting a team, strategy, equipment or anything else related to this contest.

Nationals (additional components to competition) - The top team from British Columbia will be invited to Toronto in May 2026 to compete at the nationals. Since the National Competition contains some additional components (Interview and separate autonomous challenge), teams are encouraged to check the National Scope to make sure they are ready to represent their province.

Happy Building Everyone and looking forward to seeing you at the Abbotsford Tradex in April 2026!

Steve Claassen
Skills BC Robotics Tech Chair
Highland Secondary School (Comox Valley Schools)

1. TERMS

1.1. Tele-Operated Robots are defined as elements under the direct/active control of competitors during game play using one or two radios/game controllers held by the courtside competitors.

1.2. Autonomous Robots are defined as independent elements not under the direct control of competitors throughout gameplay.

1.2.1. Autonomous Robots are elements that operate without direct input from competitors during game play.

1.2.1.1. These robots perform pre-programmed tasks using on-robot sensors (such as motor encoders, ultrasonic sensors, line follower sensors, etc.) and logic systems (including the microcontroller/programmable control unit and program).

1.2.1.2. Autonomous robots must contain and utilize a programmable control unit, electrical components, and battery.

1.2.1.2.1. Independent elements not containing these components will not be permitted.

1.2.2. The only permitted direct competitor interaction with these robots is initiation of the autonomous robot at the beginning of the game.

1.2.3. Once the expiration of the time has been complete, these devices must be turned off safely. This may be done by the NTC/Judges.

1.2.4. Mobile Independent Autonomous Robots are considered any autonomous element that moves about the court.

1.2.5. Stationary Independent Autonomous Robots are considered any autonomous element that does not move about the court.

1.2.6. Independent Autonomous Robots may interact with the team's tele-operated mobile robot.

1.2.6.1. Tele-operated Mobile Robot(s) may initiate an active response by the Independent Autonomous Robot which may be managed by a mechanical based system or a pre-programmed system internal to the Independent Autonomous Robot.

2. SAFETY

2.1. Safety is of paramount importance in all aspects of the competition.

2.1.1. All individuals on site are expected to be mindful of their surroundings and ensure they act safely at all times.

2.2. Specific expectations with regards to the Robotics competition are as follows:

2.2.1. All individuals are expected to wear eye protection at all times when they are in the competition area.

2.2.2. Teams are expected to ensure their pit area is tidy.

2.2.3. Teams are expected to have appropriate storage for their batteries when they are not on the robot.

2.2.3.1. For Lithium based batteries, teams are to have a properly rated Lithium storage bag/container.

2.2.4. All fabrication work involving material removal processes (grinding / cutting) must be completed in the designated “Grinding Booth” area.

2.2.5. All competitors must ensure they are not wearing any jewelry that could be caught in something.

2.2.5.1. This includes competitor name tags. They are to be removed and placed on the competitor pit area table while within the competition area.

2.2.6. All competitors must ensure their hair is tied back/not in their eyes, and not able to be caught in anything.

2.2.7. All individuals are expected to ensure all trip hazards are reduced as much as possible.

2.2.7.1. In situations where trip hazards cannot be eliminated, appropriate signage and notification must be made to everyone in the area.

2.2.8. All individuals are expected to ensure they are wearing appropriate footwear.

2.2.8.1. All footwear must be closed-toe shoes.

2.2.8.2. All laces must be tied.

2.2.9. All Robots must pass a safety inspection (details in Section 9).

2.2.10. Batteries must be disconnected from all robots and charging devices during the overnight periods.

2.3. Safety Scoring criteria details are available in Appendix E.

3. OVERVIEW, GAME DESCRIPTION, AND PLAY

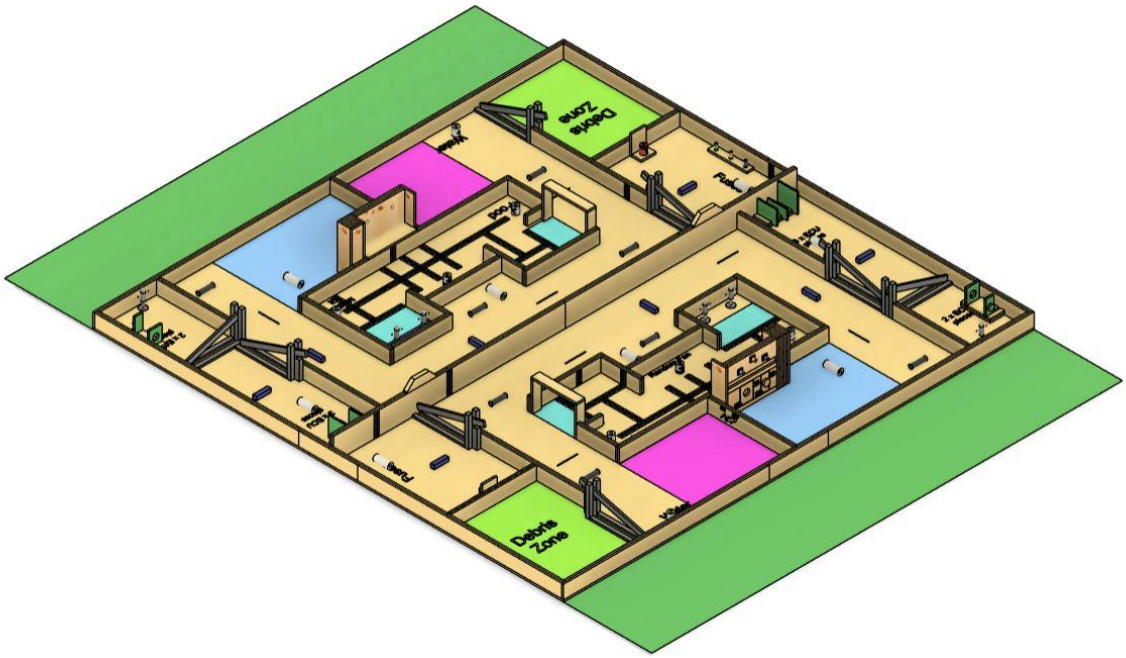

Figure: Overall Team Court

3.1. General Overview

3.1.1. This section is intended as a brief overview of the general concepts. It does not override any later sections in this document where the full details of the game play are described.

3.1.2. Scenario: A catastrophic explosion has rocked a local factory, causing severe structural damage and compromising critical infrastructure. The facility's Environmental Control Unit (ECU), responsible for regulating air quality and ventilation, has malfunctioned and must be repaired and reset before first responders can safely enter the site. Most workers have reached a secure “Safe Room” located at the center of the facility. However, intense electrical interference has disabled all radio communication in that zone, isolating those inside. One employee, Steve, remains unaccounted for. Last seen unconscious near the facility’s inner sector, Steve’s condition is deteriorating rapidly. Immediate intervention is critical to stabilize the situation and ensure all lives are preserved.

3.1.3. Objective: Teams must use a combination of tele-operated and autonomous robots to perform repairs on the ECU, clear debris, deliver supply items to the safe room, restart the ECU, and rescue Steve!

3.1.4. Restrictions:

- 3.1.4.1. Teams can use up to 2 tele-operated robot(s) and 1 independent autonomous robot.
  - 3.1.4.1.1. The autonomous robot will be used in both the "Disaster Rescue" game and the *On-Site Autonomous Challenge (Nationals ONLY).*
- 3.1.4.2. A team's full entry will start the "Disaster Rescue" game match in the lobby.
- 3.1.4.3. Matches are a maximum of 4 minutes long.
- 3.1.4.4. Tele-Operated robots cannot operate in the autonomous zone.
- 3.1.4.5. Autonomous robots may operate throughout a team's whole facility/court area.
- 3.1.4.6. Robots must remain in compliance with the full robot restrictions, as per Section 8.

3.1.5. Autonomous Robot Scoring Overview

- 3.1.5.1. Note: See Section 6 for detailed scoring information
- 3.1.5.2. Teams will receive autonomous points for:
  - 3.1.5.2.1. Delivering supply items to the safe room (extra points for the correct orientation).
  - 3.1.5.2.2. Installing the fan on the back side of the ECU.
  - 3.1.5.2.3. Leaving the figures in the safe room standing at the end of the match.
  - 3.1.5.2.4. Ending the match with their autonomous robot in the Autonomous Zone.

3.1.6. Tele-Operated Scoring Overview

- 3.1.6.1. Note: See Section 6 for detailed scoring information.
- 3.1.6.2. Teams will receive tele-operated points for:
  - 3.1.6.2.1. Moving debris into the debris zone.
  - 3.1.6.2.2. Delivering the components to the ECU zone.
  - 3.1.6.2.3. Removal and replacement of components in the ECU.
  - 3.1.6.2.4. Delivering malfunctioning ECU components to the debris zone.
  - 3.1.6.2.5. Delivering Steve to the lobby.
  - 3.1.6.2.6. Flipping the ECU breaker located in the lobby area.
    - 3.1.6.2.6.1. Note: This action ends a team's match.

3.2. Game Description

3.2.1. Games will involve two teams at a time.

3.2.2. Competitors must remain in their designated competitor zone on their side of the court.

3.2.3. Teams can utilize a maximum of TWO tele-operated robots.

3.2.4. Teams may also use a maximum of ONE autonomous robot.

3.2.5. Teams are not permitted to intentionally remove game pieces from the court area.

3.2.6. At no point is a team permitted to intentionally drop pieces off their robot.

3.2.7. At no time shall a team's robots (Tele-operated or Autonomous) interact or interfere with their opponent, opponents court, or their opponents' robots.

3.2.7.1. Intentional violations of this may result in disqualification.

3.2.8. Robots may NOT be in possession of any game components at the Start of a game.

3.2.8.1. This includes being in contact with the ECU switch.

3.2.9. Teams and their robots are not permitted to reach over any walls (exterior or interior) at any time.

3.2.9.1. Reaching over is defined as breaking the vertical plane extending from the wall surfaces nearest the robots.

3.2.9.2. A Verbal warning will be given and if the violation continues it may result in disqualification of the match

3.3. Game Play

3.3.1. Games will be played between 2 teams.

3.3.1.1. Games will last a maximum of 4 minutes.

3.3.1.1.1. Flipping the "ECU switch" in the lobby restarts the ECU and signals the termination of the team's run, which will end their competitive run before the end of the 4 minute match maximum.

3.3.1.1.2. The amount of time between matches will depend on the number of teams participating. This information will be provided to teams at the start of the competition.

3.3.1.1.3. Games will start on time.

3.3.1.1.3.1. Teams are responsible to know when their games are scheduled.

3.3.1.1.3.2. Teams arriving late will be allowed to use the remainder of the time in the game.

3.3.1.1.3.3. NTC/judges may adjust the scheduled games as necessary for the purposes of ensuring fair game play.

3.3.1.1.4. Between games, battery changes and repairs to robots may be completed at the team's assigned "Pit Area Worktable", with appropriate PPE and Safety.

3.3.1.2. It is a team decision what roles team members will fill.

3.3.1.2.1. Drivers are the competitors holding the robot controller(s) and asserting direct control over a Tele-Operated robot.

3.3.1.2.2. The Spotter is the competitor providing navigational guidance to the driver.

3.3.1.2.3. Competitors must remain in their designated competitor zones at all times during a match.

3.3.1.2.4. Competitors may change roles while a game is in progress.

3.3.1.2.5. Competitors cannot enter onto the court surface or adjust their robot during a game.

3.3.1.2.6. Only 2 competitors may participate in a match from start to finish (BC provincial teams can be up to 4 members)

3.3.2. Robots must remain in compliance with the rules in this document for the duration of the game.

3.3.2.1. Robots must start in their designated starting area, and in their designated starting position.

3.3.2.1.1. The designated starting position is the same configuration used during the volume calculation.

3.3.2.2. 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.

3.3.2.2.1. Games missed due to this situation will be forfeited.

3.3.2.2.2. Damage will be defined as any action that causes the court or components to no longer be able to function as intended.

3.3.2.2.3. It is expected that all court components will be fixed firmly in place so that the court is a Neutral Factor in the competition.

3.3.2.3. If a robot is mal-functioning and represents a hazard to participants, the court, other robots or itself, in the opinion of the NTC/Judge, then, the NTC/Judge may authorize shutting off the robot during a game.

3.3.2.3.1. Disabled robots or parts of robots not generating any safety concerns will be left on the court until the game time expires.

3.3.2.4. Robots must not leave the contest court at any time during a game.

3.3.2.5. No aerial (flying) robots are permitted.

3.3.3. During game play, NTC/Judges will have ultimate authority over game rulings, and will have full authority over team conduct in the court area.

3.3.3.1. It will be a NTC/Judge's ruling that decides if an 'End of the Game Component Placement' took place before or after the game-ending buzzer sounded.

3.3.3.2. It will be a NTC/Judge's ruling that decides if the robot is in violation of the rules of the game.

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

3.3.3.2.1.1. During a match:

1) 1st in match Warning. In-match warning when noticed.

2) 2nd in match Warning. In match warning 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.

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

1) Discussion with the team about the violation noticed with the NTC/judges.

2) Teams will not be permitted to proceed until the NTC/judges are convinced the violation is addressed.

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

3.3.4. All scoring will take place at the end of each match.

3.3.4.1. All scores will be based on the location of things at the end of each match.

3.3.4.2. Teams may end their match before the 4 minute time limit by flipping the "ECU breaker switch". If this is the case, the score for that team will be based on the location of things at this time.

3.3.5. If a piece 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.

3.3.6. Should any game pieces fall into the opponent's court area, those pieces shall remain in play and usable by the opposing team.

3.3.6.1. This applies to all game pieces which may count for points.

3.3.6.2. Should a larger game piece fall into the opposing team's court, it may be removed at the Judge's/NTC discretion.

3.4. Teams will participate in a "Round Robin" followed by a "Seeded Double Elimination Playoff Tournament".

3.5. Teams will play an equal number of "Round Robin" games.

3.5.1. Round Robin games will be played between 2 teams.

3.5.2. Overall final placement of teams in the Round Robin will be determined using the **total points scored** by a team in all of their matches.

3.5.2.1. If there exists a tie in the round robin ranking, the following Tie Breaker Protocol will be used in the final ranking.

3.5.2.1.1. First Tie Breaker: Winner of head-to-head matches between tied teams.

3.5.2.1.2. Second Tie Breaker: Total autonomous points scored by a team in all of their round robin matches.

3.5.2.1.3. Third Tie Breaker: Rematch between tied teams.

3.6. The top 8 teams will qualify for the "Seeded Double Elimination Playoff Tournament".

3.6.1. Playoff Tournament seeding will be based on the results of the Round Robin ranking.

3.6.2. The Tournament matches will occur between two teams.

3.6.3. The winner of each match will be determined by the total points scored in the match.

3.6.4. Should a match in a playoff tournament result in "Tie" during the tournament, the following Tie Breaker Protocols will be used to determine the match winner.

3.6.4.1. First Tie Breaker: Autonomous points scored in the match.

3.6.4.2. Second Tie Breaker: ECU Points scored in the match.

3.6.4.3. Third Tie Breaker: Debris points scored in the match.

3.6.4.4. Final Tie Breaker: Instant rematch between the tied teams.

3.6.4.4.1. Competitors are not permitted to modify the end-state of their robots from the tied match for use in the rematch. The robots must compete in the rematch in their end-state from the tied game, even if not functioning.

4. TEAM'S AREA AND COURT AREAS

4.1. The overall court playing surface will be a 16' by 16' square.

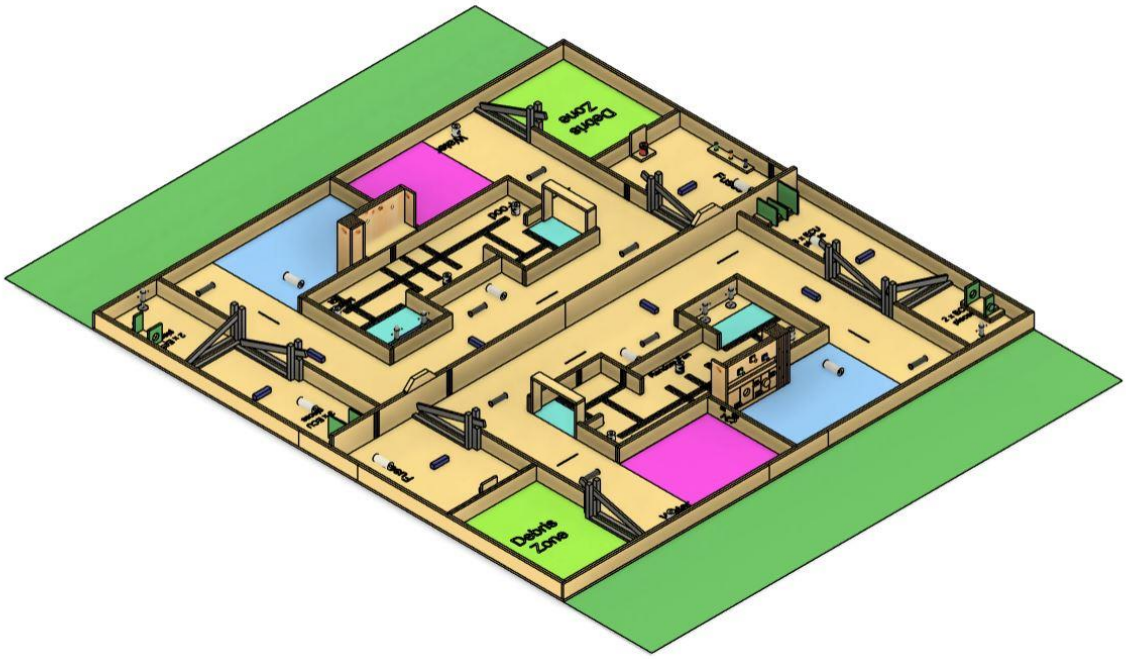

Figure: Overall Court

4.1.1. Exclusive use team spaces are 8' by 16' rectangles.

4.1.2. Perimeter court walls will be made using ¾" plywood, resulting in a 5.5" tall by 1.5" thick wall.

4.1.3. The court surface may vary between melamine, concrete, hardboard, plywood, painted plywood, or the facility floor.

4.1.4. Detailed court information is in Appendix A.

4.1.4.1. 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 in tolerance.

4.2. Court Overview - “Disaster Rescue” Game

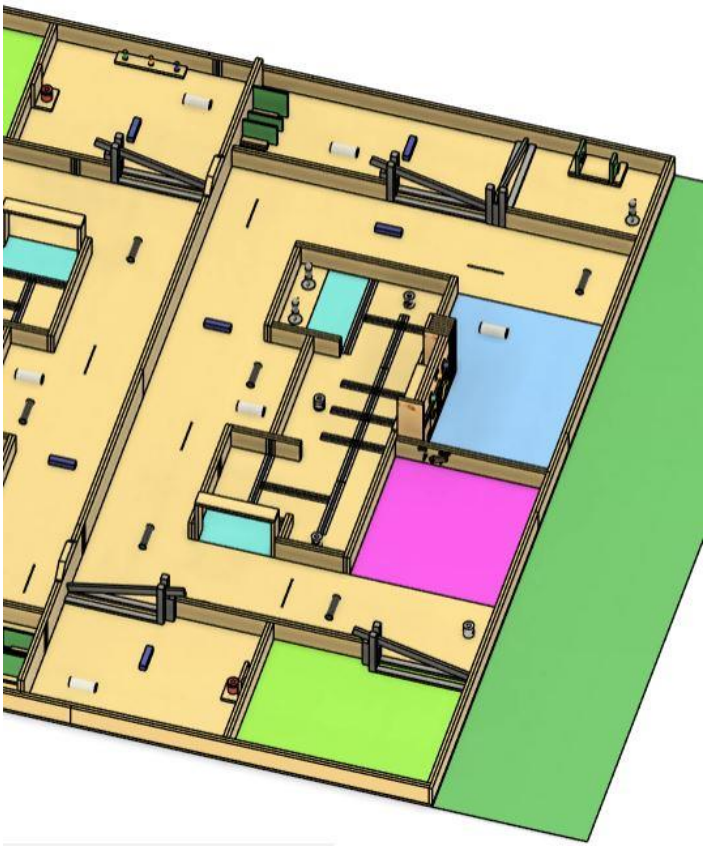

Figure: Court Overview

The court contains the following areas:

4.2.1. Lobby

- 4.2.1.1. The lobby is a 35 inch x 33.5 inch rectangular area.
- 4.2.1.2. This is the starting area for a team’s entire entry.
- 4.2.1.3. The ECU main breaker switch is located within the lobby area. It must be flipped to restore power and end a team’s run.
  - 4.2.1.3.1. For ECU Breaker Switch details see Section 5.4.7.

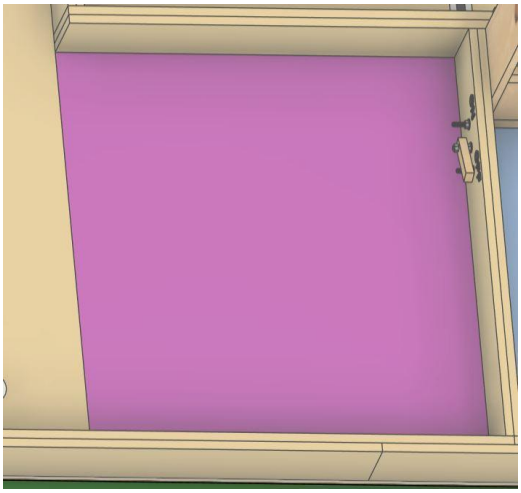

Figure: Lobby

4.2.2. Hallways

Figure: Hallways

4.2.2.1. Throughout the court area are 22 inch wide hallway areas.

4.2.2.2. Hallways are accessible to all robots in a team's entry to facilitate travel between the zones.

4.2.2.3. Debris from the explosion is spread around the hallways and will need to be brought to the “Debris Zone” for points.

4.2.2.4. Debris pieces will consist of 2x2s, 14/2 wire, 2.4 inch diameter pool noodle and 1 ½” diameter ABS pipe.

4.2.2.4.1. See Appendix A for specific details.

4.2.2.5. There will be strips of white duct tape with black electrical tape on the walls to assist with autonomous navigation.

4.2.2.5.1. See Appendix A for specific details.

4.2.3. Debris Zone

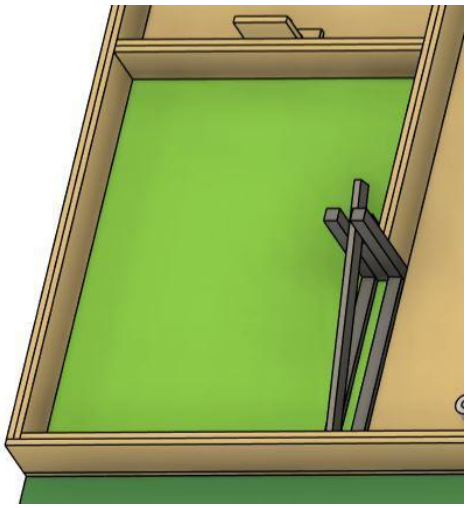

Figure: Debris Zone

4.2.3.1. Located near the Lobby, there is a “Debris Zone” room measuring 35 inches by 46 inches.

4.2.3.2. There is a “fallen beam” across the entrance to the “Debris Zone” from the “Hallway”.

4.2.3.2.1. See Section 5.2 for details.

4.2.3.3. Debris and malfunctioning ECU components can be brought to the debris zone for points.

4.2.3.4. To be considered fully delivered, the piece must be fully within the Debris zone, as defined by the vertical plane formed by the inside edge of the wall and by the inside edge of the “buckled floor” (part of the fallen beam).

4.2.3.5. Debris can be moved under or over the fallen beam for points as long as it meets the criteria in 4.2.3.4.

4.2.4. Fuse Zone

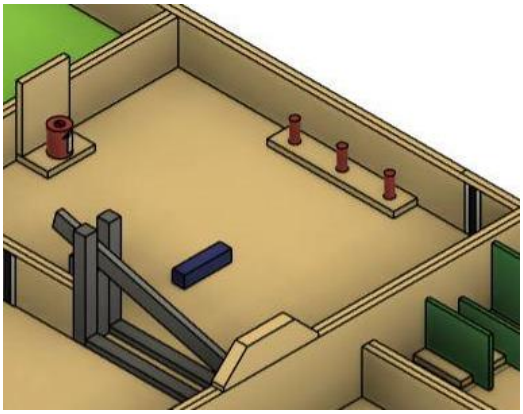

Figure: Fuse Zone

4.2.4.1. Located next to the “Debris Zone”, is the “Fuse Zone” measuring 35 inches by 46 inches.

4.2.4.2. There is a “fallen beam” across the entrance to the “Fuse Zone” from the “Hallway”.

4.2.4.2.1. See Section 5.2 for details.

4.2.4.3. The “Fuse Zone” contains three properly functioning fuses for the ECU.

4.2.4.4. The “Fuse Zone” contains the “fire extinguisher” which is to be delivered to the “Safe Room” in the “Autonomous Zone”.

4.2.4.5. For detailed locations of the components, see Appendix A.

4.2.5. ECU Component Zone

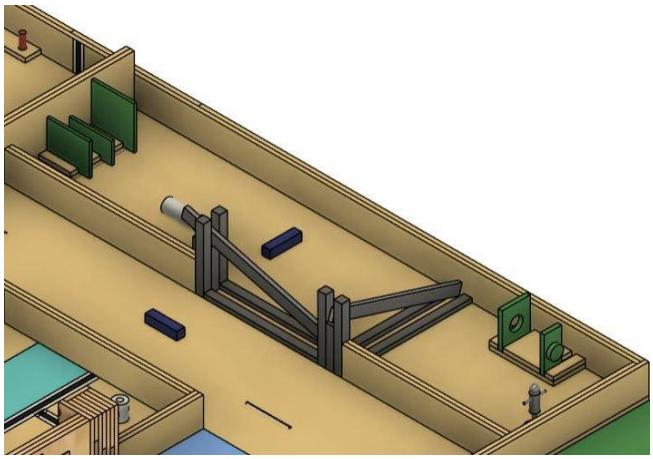

Figure: ECU Component Zone

4.2.5.1. Located on the exterior wall opposite to the “Debris Zone” and “Fuse Zone”, there is an “ECU Component Zone” measuring 23 inches x 93.5 inches.

4.2.5.2. There are 2 “fallen beams” located in this area.

4.2.5.2.1. One is across the entrance to the “ECU Component Zone” from the “Hallway”.

4.2.5.2.2. One is dividing the “ECU Component Zone” into 2 parts.

4.2.5.2.3. See Section 5.2 for details.

4.2.5.3. The ECU Component Zone contains the 2 replacement ECU Transformers and the 3 replacement ECU circuit boards.

4.2.5.4. Steve is also located in this Zone and must be brought to the lobby for points.

4.2.5.5. See Appendix A for detailed locations of components.

4.2.6. ECU Zone

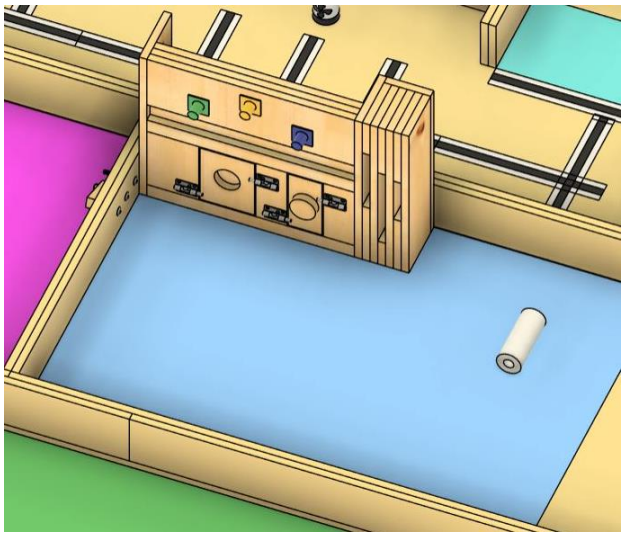

FIGURE: ECU Zone

4.2.6.1. The "ECU Zone" is located next to the lobby and measures 48 by 35 inches.

4.2.6.2. This room opens directly to the hallway.

4.2.6.3. The ECU Zone contains the Environmental Control Unit for the facility.

4.2.6.3.1. See section 5.4 for a detailed description of the ECU.

4.2.6.4. There will be a strip of white duct tape on the floor separating the ECU zone from the hallway.

4.2.6.5. There are removal points for malfunctioning pieces from the ECU, delivery points for bringing replacement pieces to the ECU Zone and installation points of working fuses, Circuit Boards and Transformers.

4.2.6.5.1. See Section 6 for full scoring details.

4.2.6.5.2. Once removed, malfunctioning pieces become debris for additional points.

4.2.7. Autonomous Zone

4.2.7.1. The “Autonomous Zone” is located in the central part of the facility and is only accessible with the team’s autonomous robot.

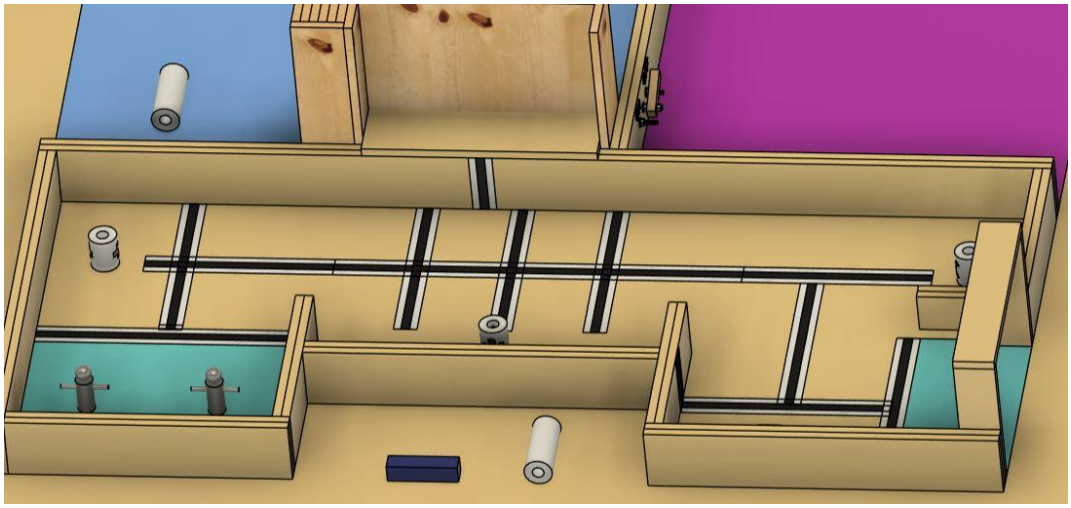

Figure: Autonomous Zone

4.2.7.2. The “Autonomous Zone” is broken down into sections:

4.2.7.2.1. The “Delivery Area” will be marked on the floor at the entrance to the autonomous zone.

4.2.7.2.1.1. This is the only part of the autonomous zone that can be accessed by tele-operated robots.

4.2.7.2.2. The “Safe Room” will be marked on the floor at the opposite end of the hallway to the “Delivery Area”. This is the target area for the food, water, medical kit and fire extinguisher.

4.2.7.2.3. The “Autonomous Hallway”, which contains:

4.2.7.2.3.1. The “Food” and “Medical kit” are located at either ends of this zone.

4.2.7.2.3.2. The “ECU Fan” will start in the B Location as shown in the Figure below.

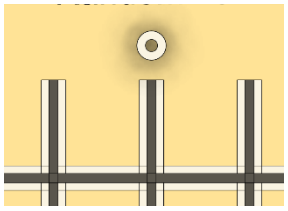

Figure: ECU Fan Starting Locations

4.2.7.2.3.2.1. At the nationals there will be a dice roll to determine the starting location of A, B, or C (See National Scope).

4.2.7.2.3.3. The “ECU Fan Platform” is located on the back side of the ECU.

4.2.7.2.3.4. There will be strips of white duct tape with black electrical tape on the floors and walls to assist with autonomous navigation.

4.2.7.2.3.5. See Appendix A for detailed component locations.

4.2.7.3. Located within the “Safe Room” are 2 “Workers”.

4.2.7.3.1. These workers must remain standing in this area for points.

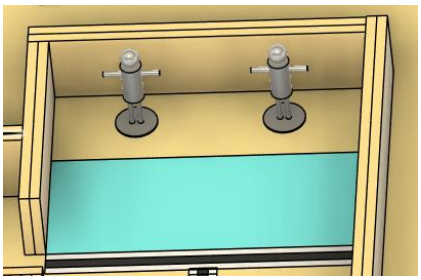

Figure: Workers

4.3. Competitor Zones

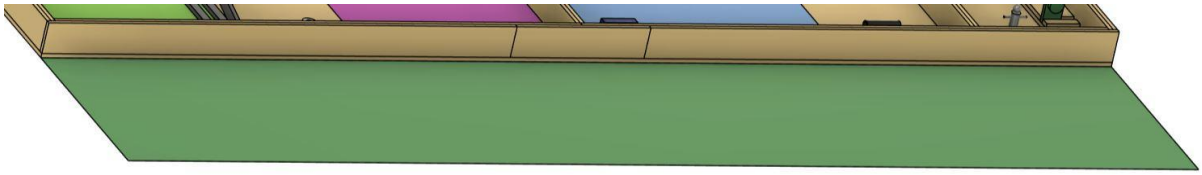

Figure: Competitor Zone

4.3.1. Each driver or spotter must remain in their designated competitor zone.

4.3.1.1. A maximum of 2 competitors from each team may fill these roles.

4.3.1.1.1. This means a team could have 2 drivers OR 1 driver and 1 spotter.

4.3.1.2. Any additional competitors not filling one of these roles must remain at least 6 feet away from the court.

4.3.2. Both competitors may occupy any space within the competitor zone.

4.3.3. Competitor zones are located on the exterior ends of the court.

4.3.4. Each team has 1 designated competitor zone that is 36” wide and 16’ in length.

4.3.5. No other competitors are permitted within 6 feet of the court.

4.3.5.1. This includes bystander competitors from other teams.

4.3.6. See “Court Dimensions” in Appendix A for detailed dimensions.

5. DETAILED GAME COMPONENTS

5.1. Debris

5.1.1. Throughout the court area, there are 16 pieces of debris.

5.1.1.1. 4 pieces of debris are 6 inch long 2x2 pieces.

5.1.1.2. 4 pieces of debris are 6 inch long AND 1.5 inch diameter ABS pipe.

5.1.1.3. 4 pieces of debris are 6 inch long AND 2.4 inch diameter pool noodle.

5.1.1.3.1. Pool noodles may be a variety of colours.

5.1.1.4. 4 pieces of debris are 8 inch long of 14/2 wire.

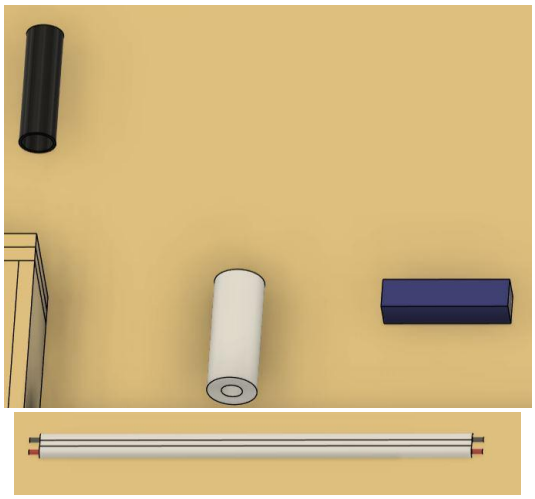

Figure: Debris Pieces

5.1.2. Locations are predetermined as outlined in Appendix A.

5.1.3. Debris pieces are to be collected and moved into the debris zone for points.

5.2. Fallen Beams

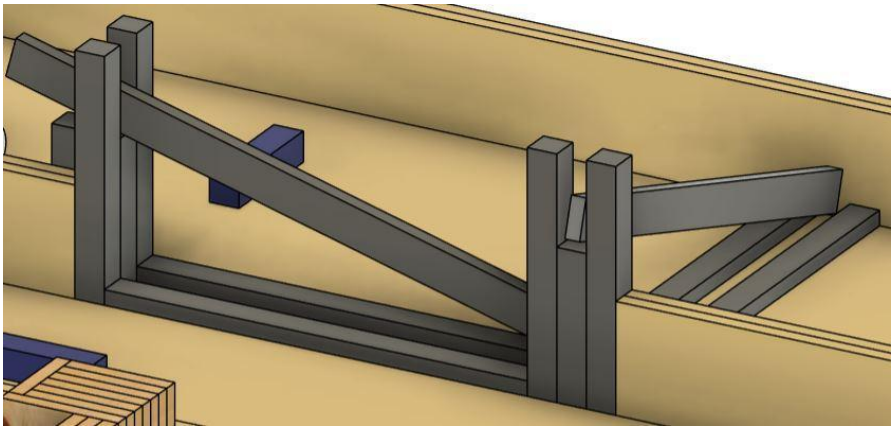

Figure: Fallen Beams

5.2.1. Fallen beams are intended to be obstacles restricting access to areas of the court.

5.2.1.1. Fallen beams block the entrance of some areas.

5.2.1.2. Robots must manipulate these to gain access.
Robots are permitted to move these pieces, including separating the "fallen beam" from the "door frame", provided they are not damaging either piece.

5.2.2. "Fallen Beams" consist of 3 main parts:

5.2.2.1. "Door Frame" composed of two 2x2s and one 2x4.

5.2.2.1.1. The 2x4 is located directly in between the 2x2s.

5.2.2.1.2. This results in a slot at the top of the "Door Frame".

5.2.2.2. Fallen Beam composed of one 28 inch by 2 inch piece of ¾ inch plywood.

5.2.2.2.1. This is laying across the opening, placed inside the top slot of the "Door Frame".

5.2.2.3. "Buckled Floor" composed of two 21.5 inch by 1.5 inch pieces of ¾ inch plywood.

5.2.2.3.1. Each piece is aligned with the 2x2 of the "Door Frame".

5.2.2.4. For full details of the "Fallen Beams" see Appendix A.

5.3. Supply Items

5.3.1. There are 4 supply items that teams will need to be moved into the “Safe Room” in the autonomous zone.

5.3.1.1. There is 1 “water” supply item, located in the “Hallway” directly next to the “Lobby”.

5.3.1.2. There is 1 “food” supply item, located in the “Autonomous Hallway”.

5.3.1.3. There is 1 “medical kit” supply item, located in the “Autonomous Hallway”.

5.3.1.4. There is 1 “fire extinguisher” supply item, located in the “Fuse Zone”.

5.3.2. All supply items will consist of 3” long pieces of 2.4 inch diameter pool noodle with electrical tape wrapped around one end that indicates the top of the piece.

5.3.2.1. The pool noodle pieces will remain cylindrical after the tape is applied.

5.3.2.2. Pool noodles may be a variety of colours.

Figure: Supply Items

5.3.3. Robots are to retrieve and deliver the supply items from their starting locations to the “Safe Room” in the autonomous zone.

5.3.3.1. Only autonomous robots are permitted in the autonomous zone.

5.3.3.2. Delivering the supply pieces which start outside of the autonomous zone to the autonomous zone can be completed using the autonomous robot or a tele-operated robot.

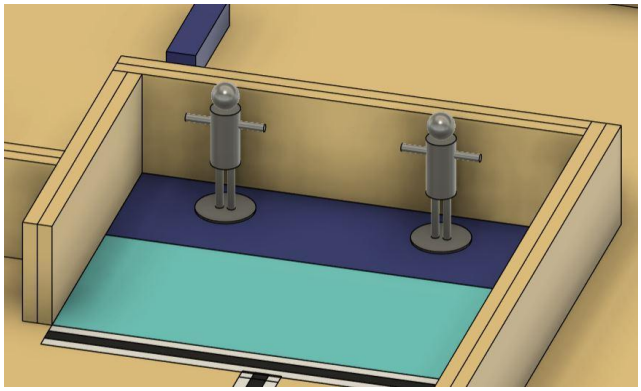

Figure: Safe Room

5.4. Environmental Control Unit (ECU)

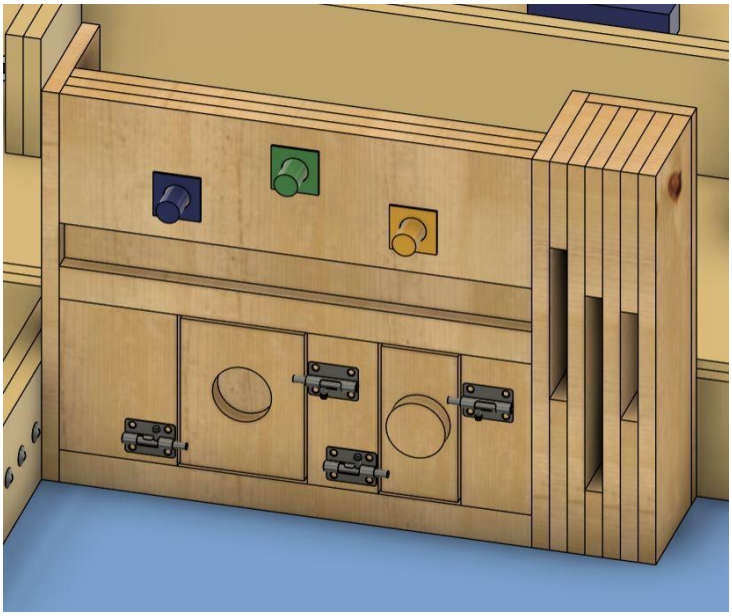

Figure: ECU

5.4.1. The ECU is located in the ECU Zone and backs onto the Autonomous Zone.

5.4.2. ECU base is constructed of ¾ inch plywood, as described in Appendix A.

5.4.2.1. On the front face of the ECU, there are 3 fuse slots, 2 transformer slots, and 3 circuit board slots.

5.4.2.1.1. The fuse slots are 1 ⅛ inch diameter holes 1.5 inches deep on the upper portion of the ECU.

5.4.2.1.2. Each fuse slot is colour coded to match the appropriate “properly functioning” fuse.

5.4.2.1.3. The transformer slots are ¾ inch deep slots with barrel bolts on the edge.

5.4.2.1.3.1. The barrel bolts are intended to hold the transformers in place.

5.4.2.1.3.2. Dimensions of the slots are noted in Appendix A

5.4.2.1.4. The circuit board slots are ¾ inch wide, 5 inches deep.

5.4.2.1.4.1. Exact dimensions for the height can be found in Appendix A.

5.4.2.2. On the back of the ECU, there is the “fan platform”, which is part of the autonomous zone.

5.4.2.2.1. This platform is intended for the installation of the “fan” by the autonomous robot.

5.4.3. The ECU contains the following “malfunctioning” components that will need to be removed from the ECU and replaced by the “properly functioning” components.

5.4.3.1. 3 Fuses

5.4.3.1.1. Each fuse is composed of a 3 inch long, 1 inch diameter dowel.

5.4.3.1.2. Each fuse is colour coded.

5.4.3.1.2.1. Malfunctioning fuses are black in colour and have an X on the end.

5.4.3.1.2.2. Properly functioning fuses are Orange, Green, Blue.

5.4.3.1.3. Each fuse has an un-coloured area. This signifies the end of the fuse that is intended to be installed into the ECU.

5.4.3.1.4. To be considered properly replaced, the fuse must be fully inserted into the matching coloured ECU slot. This is defined as the un-coloured end of the fuse inserted into the correctly coloured fuse slot, with no un-coloured section showing.

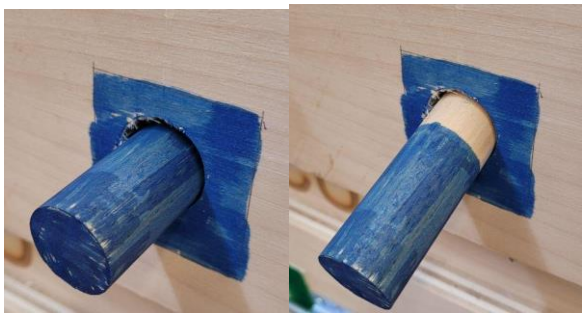

Figure: Correctly installed (Left) vs NOT correctly installed fuses (Right)

5.4.3.2. 2 Transformers

5.4.3.2.1. Each transformer is composed of a ¾ inch thick plywood piece.

5.4.3.2.1.1. One transformer piece is 5.5 inches x 7 inches with a 2.5 inch diameter hole cut out of the middle.

5.4.3.2.1.2. One transformer piece is 3.5 inches x 7 inches with a 2.25 inch diameter circular piece installed on the center of the front face of the piece.

5.4.3.2.2. Transformers are held in the ECU by barrel bolts, with the bolt of each slid over a portion of the width of the transformer.

5.4.3.2.2.1. To remove the transformer, teams will be required to slide the bolt from the barrel bolt to the unlocked position.

5.4.3.2.2.2. Note: Barrel bolts will be installed so that the “knob handle slots” are facing upwards. This will result in the lower side of the barrel bolts having no “knob slots”. See figure for orientation:

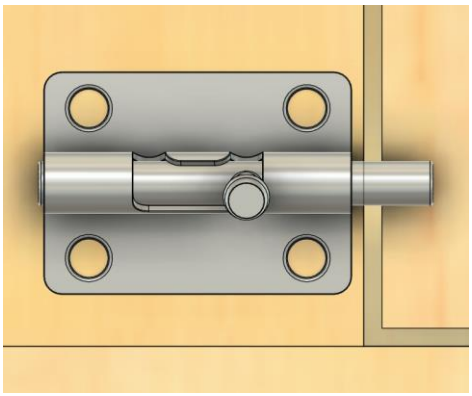

Figure: Barrel Bolt Installation

5.4.3.2.3. Malfunctioning transformers are designated with a large X on their face.

5.4.3.2.4. Properly functioning transformers are designated with a green coloured border.

5.4.3.2.5. To be considered properly replaced, the transformer must be fully inserted into the ECU slot and have both bolts from the 2 barrel bolts slid over a portion of the width of the board.

Figure: Properly Installed Transformers

5.4.3.3. 3 Circuit boards

5.4.3.3.1. Each circuit board is composed of a ½ inch thick plywood piece.

5.4.3.3.1.1. One circuit board is 6 inches x 8 inches.

5.4.3.3.1.2. One circuit board is 6 inches x 4 inches.

5.4.3.3.1.3. One circuit board is 6 inches by 6 inches.

5.4.3.3.2. Malfunctioning circuit boards are designated with a large X on their face.

5.4.3.3.3. Properly functioning circuit boards will have a 3.5-inch-wide green strip along their front-facing edge. This coloured section indicates correct installation and operational status.

5.4.3.3.4. To be considered properly replaced, the circuit board must be fully inserted into the ECU slot. This is defined as having the uncoloured portion of the circuit board inserted into the slot and pushed in far enough that no uncoloured portion is remaining outside of the slot.

5.4.4. The ECU also requires a “properly functioning fan” to be installed.

5.4.4.1. The “Fan” is located in the autonomous robot zone, as described in Section 4.7.2.

5.4.4.2. The “Fan” must be installed by placing it onto the “ECU Fan Platform” by the autonomous robot.

5.4.4.3. The “Fan” is composed of one 3 inch long piece of 2.4 inch diameter pool noodle.

5.4.4.4. The “Fan” will start the match as shown below (At the national competition Dice will be rolled to determine the stating location)

5.4.4.4.1. Note: There is <u>no malfunctioning fan</u> that needs to be removed from the ECU.

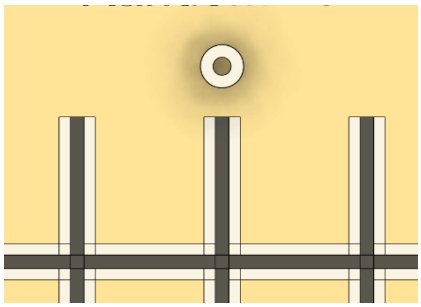

Figure: ECU Fan Starting Locations

5.4.5. Points are available for the removal of the malfunctioning pieces and the correct installation of the replacement pieces.

5.4.6. Once a malfunctioning component is removed from the ECU it is considered debris and is eligible for “debris points”.

5.4.6.1. These pieces become debris for the purposes of points.

5.4.6.2. They are in addition to the already existing debris pieces, described in section 5.1.

5.4.7. Teams can also earn “Breaker Points” for each piece that is correctly installed when the “ECU Breaker Switch” is flipped which signifies the end of the match for the team.

Figure: ECU Breaker Switch

5.4.7.1. “ECU Breaker Switch” is located in the lobby.

5.4.7.2. “ECU Breaker Switch” is a simple switch which starts the match in the “off” position.

5.4.7.2.1. The switch is constructed of plywood and bolts, described in Appendix A.

5.4.7.3. Flipping the switch to the “on” position immediately ends the match for the team flipping the switch only.

5.4.7.3.1. To be considered flipped to the “on” position, the switch toggle pole must be in contact with the “on” terminal.

5.4.7.4. This only ends the match if flipped prior to the expiration of the 4 minute match time limit.

5.4.7.4.1. The switch is not permitted to be flipped after the expiration of the 4 minute match time limit.

5.5. Steve

5.5.1. Steve is a 8” tall poseable figure that will be in this configuration:

5.5.2. Steve is located in the “ECU Component Zone” near the competitor area.

5.5.2.1. See Appendix A for detailed location.

5.5.3. Teams receive points for bringing Steve to the lobby.

Figure: Steve In Starting Configuration.

5.6. Trapped Workers

5.6.1. There are 2 trapped workers (Steve Sr & Steve Jr) located in the “Safe Room” within the “Autonomous Zone”.

5.6.1.1. Points are available if these workers remain standing in the “Safe Room”.

5.6.1.2. See Appendix A for specific starting locations.

5.6.2. They are 8” tall poseable figure that will be in this configuration:

FIGURE: Workers in starting configuration.

5.7. Walls and the Court Area

5.7.1. Walls in this scenario extend up to the ceiling of the facility. As such, at no time are teams permitted to intentionally reach over any wall.

5.7.1.1. Teams are not permitted to cross the middle barrier.

5.7.1.2. Teams are not permitted to cross any interior walls.

5.7.1.3. Reaching over a wall is considered breaking the vertical plane formed by the closest edge of the wall.

5.7.2. “Fallen Beams” can be moved through their holders along a wall.

5.7.3. Game pieces are not permitted to cross over walls.

5.7.3.1. This includes any game pieces being held by a robot.

5.7.3.2. This includes any game pieces not being held by a robot.

5.7.4. Any game pieces which fall outside of the court area are no longer in play.

5.7.5. Should any game pieces fall into the opponent's court area, those pieces shall remain in play and usable by the opposing team.

5.7.5.1. This applies to all game pieces which may count for points.

5.7.5.2. Should a larger game piece fall into the opposing team’s court, it may be removed at the Judge’s/NTC discretion.

“DISASTER RESCUE” GAME SCORING SUMMARY

5.8. All scoring will take place at the end of each match.
- 5.8.1. All scores will be based on the location of things at the end of each match.
- 5.8.2. A match will last a maximum of 4 minutes.
- 5.8.3. Teams may end their match before the 4 minute time limit by flipping the “ECU breaker switch”. If this is the case, the score for that team will be based on the location of things at this time.

5.9. Debris Points
- 5.9.1. Teams will receive 1 point for each piece of debris that is within the “Debris Zone” at the end of the match.
  - 5.9.1.1. Within the zone is defined as no part of the debris can be breaking the vertical plane formed by the inside wall of the debris zone OR the vertical plane formed by the inside edge of the “buckled floor”.
- 5.9.2. Debris pieces in contact with the robot at the end of the match are eligible for points as long as they are completely within the Debris Zone.
- 5.9.3. The malfunctioning ECU components are considered debris and are eligible for debris points.
- 5.9.4. For the purpose of a tie-breaker, the points described in this section (Section 6.2) are considered the “Debris Points”.

5.10. ECU Points
- 5.10.1. Each fully removed malfunctioning ECU component is worth 1 point.
  - 5.10.1.1. Fully removing means that the component is not making contact with the ECU.
  - 5.10.1.2. Once removed, malfunctioning ECU components are considered debris and are eligible for the debris points as described in Section 6.2.
- 5.10.2. 1 point for delivering each “Properly Functioning ECU Component” to the ECU zone.
  - 5.10.2.1. To be considered eligible for delivery points a “Properly Functioning ECU Component” must be completely within the ECU zone defined by the vertical planes of the walls and the inside edge of the tape marking the zone.
  - 5.10.2.2. Components touching a robot at the end of the match are still eligible for delivery points as long as they are fully within the ECU zone.
- 5.10.3. 2 points for each correctly installed “Replacement Fuse”.
  - 5.10.3.1. See Section 5.4.3.1.4. for the definition of correctly installed.
- 5.10.4. 2 Points for each correctly installed “Replacement Circuit Board”.
  - 5.10.4.1. See Section 5.4.3.3.4. for the definition of correctly installed.
- 5.10.5. 4 Points for each correctly installed “Transformer”.

5.10.5.1. See Section 5.4.3.2.5. for the definition of correctly installed

5.10.6. 1 Additional point for each “Properly Functioning ECU Component” that is correctly and fully installed in the ECU when the ECU Breaker switch is flipped.

5.10.6.1. This includes all “Properly Functioning ECU Component” (3 fuses, 2 transformers, 3 circuit boards, and 1 fan).

5.10.6.2. Note: Flipping the breaker switch itself is not worth any points. Points are only awarded for the correctly installed “Properly Functioning ECU Components”.

5.10.6.3. Note: Flipping the switch signifies the end of the run, which may be used for "First to Complete” points described in Section 6.6.

5.10.7. For the purpose of a tie-breaker, the points described in this section (Section 6.3) are considered the “ECU Points”.

5.11. Steve Points

5.11.1. 5 points for bringing Steve to the lobby.

5.11.2. To be eligible for points, Steve must be completely within the lobby defined by the vertical planes formed by the lobby walls and the inside edge of the tape marking the edge of the lobby.

5.11.3. Steve is still eligible for points if he is held by the robot at the end of the match.

5.12. Autonomous Scoring

5.12.1. 5 points for having the Autonomous Robot completely within the “Autonomous Zone” at the end of the match.

5.12.1.1. Completely within means the robot is fully within the “Autonomous Zone” as defined by the interior vertical plane of the walls and interior vertical plane of the “Autonomous Zone Entrance Archway”.

5.12.1.2. The “Delivery Zone” is considered part of the “Autonomous Zone”.

5.12.2. 2 points for each supply item delivered completely within the “Safe Room” (food, water, medical kit and fire extinguisher).

5.12.2.1. “Completely within” means the supply item is fully within the safe room, as defined by the interior vertical plane of the walls and “Safe Room” edge of the tape line barrier.

5.12.2.1.1. This includes if the robot is in contact with the supply item.

5.12.3. 1 additional point is available for the correct orientation of each supply item.

5.12.3.1. The tape indicates the top of the supply item. To be eligible for orientation points the bottom of the supply item must be on the floor.

5.12.3.2. To be eligible for the orientation points, the supply item must be free-standing.

5.12.3.2.1. Robots cannot be touching the supply item for it to be considered free-standing.

5.12.3.2.2. To be considered freestanding the supply item must not be supported by the walls or “Workers”.

5.12.3.2.2.1. They may be in contact with these, but must not be supported by them.

5.12.4. 4 points for the “fan” on the “ECU Fan Platform”.

5.12.4.1. To be eligible for points the ECU fan must be fully supported by the “ECU Fan Platform” and cannot be in contact with a robot.

5.12.4.2. Note: There are no orientation points for the ECU fan.

5.12.5. 2 points for each “Worker” freestanding.

5.12.5.1. Robots cannot be touching the “Worker” for it to be considered free-standing.

5.12.5.2. To be considered freestanding the “Workers” must not be supported by the walls or “Supply Items”.

5.12.5.2.1. They may be in contact with these, but must not be supported by them.

5.12.6. For the purpose of a tie-breaker, the points described in this section (Section 6.5) are considered the “Autonomous Points”.

5.13. First to Complete

5.13.1. 1 point will be awarded to the team who fully completes all tasks in the challenge first.

5.13.1.1. Fully completed means:

5.13.1.1.1. All malfunctioning ECU parts have been removed from the ECU.

5.13.1.1.2. All properly functioning ECU parts have been properly installed in the ECU, including the “fan”.

5.13.1.1.3. All debris pieces, including the malfunctioning ECU parts, have been delivered to the “Debris Zone”.

5.13.1.1.4. All supply items have been properly delivered into the safe room.

5.13.1.1.5. All supply items are in the correct orientation.

5.13.1.1.6. Steve has been taken to the lobby.

5.13.1.1.7. The team’s autonomous robot is within the autonomous zone.

5.13.1.1.8. The team flips the “ECU Breaker Switch”.

6. PIT AREA AND COURT ACCESS

6.1 Competitors MUST wear safety glasses when doing fabrication work involving material removal or adding processes (grinding, cutting, soldering, etc.).

6.2. Only registered competitors are permitted in the contest space.

6.3. 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.

- 6.3.1. Designated teacher/industry team advisors are not permitted in the competition area once the competition has started.
- 6.3.2. Teachers and industry advisors are not permitted to handle tools or robot parts once the team has checked in.
- 6.3.3. Students must complete all repairs and modifications on their robot themselves. Robots cannot be removed from the competition area during the event.

6.4. A pit area is provided so that students may make repairs and improvements to their robots between games.

- 6.4.1. Teams will be provided with a worktable, chairs and a power outlet.
- 6.4.2. Note: There will not be wifi available at the Provincial Competition. Teams should make sure they can access any code or other digital resources offline.
- 6.4.3. Teams must have purpose-built tabletop robot stands, designed to keep robot wheels off the ground/tabletop surface regardless of orientation.
  - 6.4.3.1. 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.

- 6.4.4. A team's pit area must be kept safe at all times.
  - 6.4.4.1. This specifically means:
    - 6.4.4.1.1. Robots must be on the stand at all times when a battery is installed and connected to the robot
    - 6.4.4.1.2. Pit areas must be kept clean, tidy and free of all tripping hazards.

7. ROBOT RESTRICTIONS

7.1. 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.

7.2. Teams are permitted to enter 2 tele-operated robots and 1 autonomous robot in total for the competition.

7.3. Start of Game Status - “Disaster Rescue” Game

7.3.1. A team’s entire entry, including up to 2 tele-operated robot(s) and 1 independent autonomous robot, must not exceed an overall size of 5 cubic feet (8640 cubic inches) at the start of each game.

7.3.1.1. Total volume will be measured of the combined robots (in their starting position).

7.3.1.1.1. Robots may be touching, stacked on top of each other, leaning against each other. And **MUST MATCH** the starting position as demonstrated at the time of inspection.

7.3.1.2. Team entries may expand to a larger size once a game has started.

7.3.2. All robots must start together in the “Disaster Rescue” game completely within the lobby described in Section 4.2.1.

7.3.3. Teams will be permitted to start the Autonomous robot 10 seconds prior to the match beginning, but it must remain stationary until the beginning of the match.

7.3.4. All details for starting configurations and locations for components can be found in Appendix A.

7.3.5. 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:

7.3.5.1. They must be stationary.

7.3.5.2. They must not be in possession of any game pieces.

7.3.6. All systems may be turned ON.

7.3.7. Air System Circuits may be fully charged to 100 PSI, and their compressors can be ON.

7.4. During Game Status - “Disaster Rescue” Game

7.4.1. Robots may expand beyond the starting volume once the game begins.

7.4.1.1. All Robots must remain in their own team’s court.

7.4.1.2. All Tele-operated Robots are permitted to access any area within the team’s exclusive use area, except the “Autonomous Zone”.

7.4.1.3. The team’s autonomous robot is permitted to access any area within the team’s exclusive use area.

7.4.2. 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.

7.5. Each team's autonomous robot must not have any direct interaction with the competitors.

7.6. All Robots must conform to all of the following safety requirements.

7.6.1. All Robots (Tele-operated and Autonomous) must be able to be shut off with a single motion. The single motion mechanism is considered the "kill switch" for the purposes of this document.

7.6.1.1. The "Kill Switch" must be easily accessible.

7.6.1.2. The "Kill Switch" must be securely mounted.

7.6.1.3. Robot controller receivers may be in an independent circuit.

7.6.2. Robot power sources and circuits must follow the following requirements:

7.6.2.1. The maximum continuous power rating allowed in any circuit branch is 256 Watts, which will be limited by voltage and fuse selection.

7.6.2.1.1. To calculate power in any given circuit, use the following formula: Power (Watts) = Voltage (Volts) x Current (Amps).

7.6.2.2. The total voltage in any individual circuit cannot exceed 24 Volts.

7.6.2.3. 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.

7.6.2.3.1. Systems which utilize a built in fuse will be considered to have this requirement met, as long as:

7.6.2.3.1.1. It is a known and documented system. If the system is unknown to the NTC, teams may be required to produce this documentation.

7.6.2.3.1.2. There are no modifications made to the system.

7.6.2.3.1.3. There are no external circuits which do not contain a fused circuit. Proper fuses are required for modified circuits.

7.6.2.4. Batteries must meet the following requirements:

7.6.2.4.1. All batteries must be a complete sealed commercial battery pack.

7.6.2.4.2. All batteries must be securely mounted to the robot.

7.6.2.4.3. Batteries wired in series should be the same amp hour rating (ex. both 1500 mAh) and batteries in parallel must be the same voltage (ex. both 12 volts).

7.6.3. Robots utilizing non-electrical energy sources must meet the following requirements:

7.6.3.1. Pneumatic systems are permitted, with the following restrictions:

7.6.3.1.1. Pneumatic based energy sources may be pre-charged to a maximum of 100-PSI pressure in their reservoirs (cylinders) at the start of each game.

7.6.3.1.2. Pneumatic systems using Competitor-made or modified air pressure hardware are NOT permitted.

7.6.3.1.3. All pressurized tanks on robots must have a pressure gauge to indicate the stored pressure and a form of automatic overpressure safety relief system.

7.6.3.1.4. The pressure tanks and related gauges / controls must be shielded from damage due to collisions or flying target objects.

7.6.3.1.5. The stored pressure in the tank must not exceed a maximum of 100 PSI at any time.

7.6.3.2. 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.

7.6.4. The following devices are not permitted:

7.6.4.1. No explosive materials of any kind may be used (either, gunpowder, acetylene etc.).

7.6.4.2. Laser devices are not permitted.

7.6.4.3. Hydraulic fluid systems are not permitted.

7.7. Teams must use an appropriate Robot Controller.

7.7.1. It is recommended (not required) that all teams use 2.4 GHz “non-crystal” control systems on Tele-operated Robots.

7.7.2. Teams are allowed the use of an unlimited number of channels, but only two separate tele-operated robots.

7.7.2.1. Teams assume full responsibility if any interference is to occur with their respective communication systems that could render the robot(s) useless.

7.7.2.2. Robots may not transmit audio/visual information to off the robot devices, including anything directly observable by the driver(s) or spotter(s). (Ex: Having a camera transmit images real time to a computer near the driver, etc.).

8. INSPECTION

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

8.1.1. If any modifications are made on a Robot during the competition, the Robots may be subjected to an additional inspection for compliance before being permitted to participate in games.

8.1.2. All Robots must be inspected, including the Tele-operated robots and Autonomous robots in a team's entry.

8.2. It is the purpose of the inspection to ensure teams and all Robots are in compliance with the rules and restrictions described in this document.

8.3. Team entries will be measured for total combined volume.

8.3.1. All Robots will be measured in their starting positions/configuration for a combined volume of 5 cubic feet (8640 cubic inches).

8.3.2. Volume of the Robots will be calculated using the maximum length, width, and height of the entry, using the formula V = LWH.

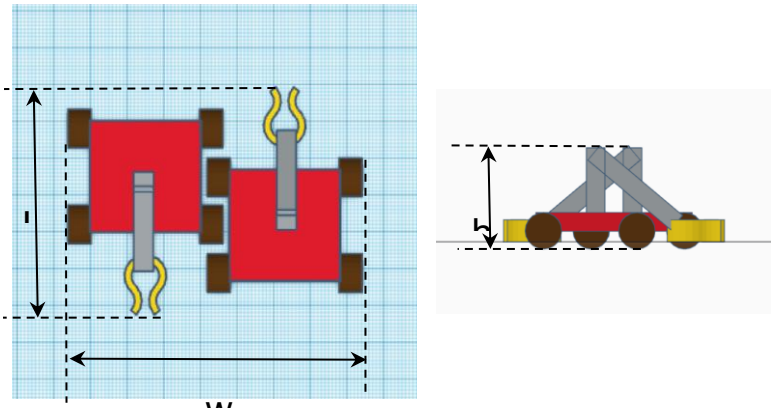

Figure: Volume Measurement

8.4. Teams will be required to demonstrate the operation of their robots as part of the inspection.

8.4.1. A demonstration of a team's Robot entry (or entries) must show the functionality of the robot to play the game.

8.4.2. All Robots must be shown to be in full compliance with the rules of the game, as described in this document.

8.4.2.1. Should any clarification document be made, it will also be considered as part of this document.

8.5. All teams and Robots must abide by all safety requirements.

8.5.1. All robots must have a wiring diagram.

8.5.1.1. Acceptable examples of wiring diagrams are available in Appendix C.

8.5.2. All Robots must have a method of shutting off the robot with a single motion. For the purposes of this document, this will be called a “kill switch”.
- 8.5.2.1. The “kill switch” must be easily accessible.
- 8.5.2.2. The Robots must be able to be safely turned off, without risk to anyone.

8.5.3. All teams must ensure the appropriate Safety Data Sheet (SDS) is available and on-site for all chemical based components.
- 8.5.3.1. This includes all batteries, as well as any other component that may be chemical based.
- 8.5.3.2. The National Technical Committee has provided SDS for a range of batteries that the Provincial Tech Chair has access to, as listed in Appendix E. If your battery is on that list, you do not need to provide one.
  - 8.5.3.2.1. If your battery is not on that list, you will need to provide the NTC/Provincial Tech Chair with the appropriate SDS.
  - 8.5.3.2.2. If you are unsure if your battery matches one on the list, please reach out to your NTC/Provincial Tech representative.

8.5.4. All batteries must be in good working condition.
- 8.5.4.1. Batteries must be complete sealed commercial battery packs.
- 8.5.4.2. Batteries must be securely mounted.
  - 8.5.4.2.1. Securely mounted is defined as not able to be knocked off of the robot in any manner of regular gameplay.
- 8.5.4.3. Batteries wired in series should be the same amp hour rating.
- 8.5.4.4. Batteries wired in parallel should be the same voltage.

8.5.5. All teams must have a tabletop robot stand for their robots.
- 8.5.5.1. 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.

8.5.6. All Robots will be inspected to ensure all parts are permitted parts.
- 8.5.6.1. Should any non-permitted part be detected, teams will be required to remove them before being allowed to compete.

8.5.7. The maximum continuous power rating allowed in any circuit branch is 256 Watts, which will be limited by voltage and fuse selection.
- 8.5.7.1. Power will be calculated using the formula Power = Voltage x Current.
- 8.5.7.2. The total voltage in any circuit cannot exceed 24 Volts.
- 8.5.7.3. 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.
  - 8.5.7.3.1. It is the purpose of a fuse/breaker to protect competitors and the equipment in their circuits.
  - 8.5.7.3.2. Systems which utilize a built in fuse will be considered to have this requirement met, as long as:

8.5.7.3.2.1. It is a known and documented system. If the system is unknown to the NTC, teams may be required to produce this documentation.

8.5.7.3.2.2. There are no modifications made to the system.

8.5.7.3.2.3. There are no external circuits which do not contain a fused circuit.

8.5.8. Teams are expected to have appropriate storage for their batteries when they are not on the robot.

8.5.8.1. For Lithium based batteries, teams are to have a properly rated Lithium storage bag/container.

8.5.9. Any teams using pressure based systems must ensure:

8.5.9.1. No Competitor-made or modified air pressure hardware is being used.

8.5.9.2. Only commercially manufactured pressure tanks (cylinders) can be used.

8.5.9.3. Pressure in tanks does not exceed 100 PSI.

8.5.9.4. Systems have an over-pressure safety valve.

8.5.9.5. Pressure tanks and related gauges and controls are shielded from damage due to collisions.

8.5.9.6. Pressure system circuit diagram is provided.

8.5.10. All teams must have eye protection available.

8.5.11. All teams must wear eye protection while in the competition area.

8.5.12. All teams' pit areas must be kept tidy and free from safety concerns.

9. APPENDIX

Please see the following Appendices on the Skills BC Website under Contest Descriptions for further information AS PER THE Appendix description below.

Appendix A - Court Dimensions
Appendix B - Scoresheet
Appendix C - Sample Wiring Diagram
Appendix D - Inspection
Appendix E – Battery List