SCNC 2019 25 YEARS

SCNC
SKILLS CANADA NATIONAL COMPETITION

OCMT 2019 25 ANS

OCMT
OLYMPIADES CANADIENNES DES MÉTIERS ET DES TECHNOLOGIES

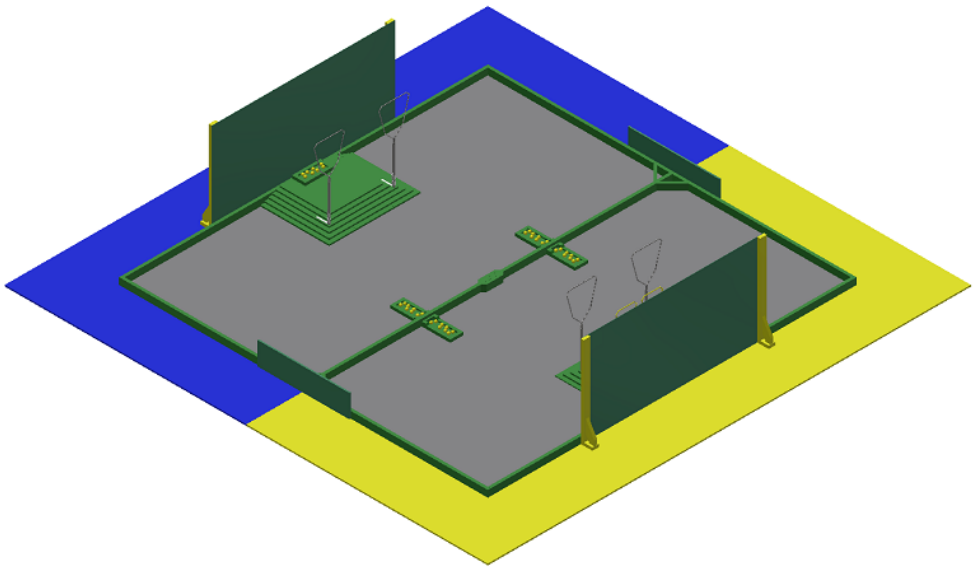
Skills Compétences Canada
Halifax2019

TEST PROJECT / PROJET D'ÉPREUVE

MOBILE ROBOTICS
ROBOTIQUE MOBILE

SECONDARY /
NIVEAU SECONDAIRE

Dueling Citadels



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1. Definition of terms referenced in this document

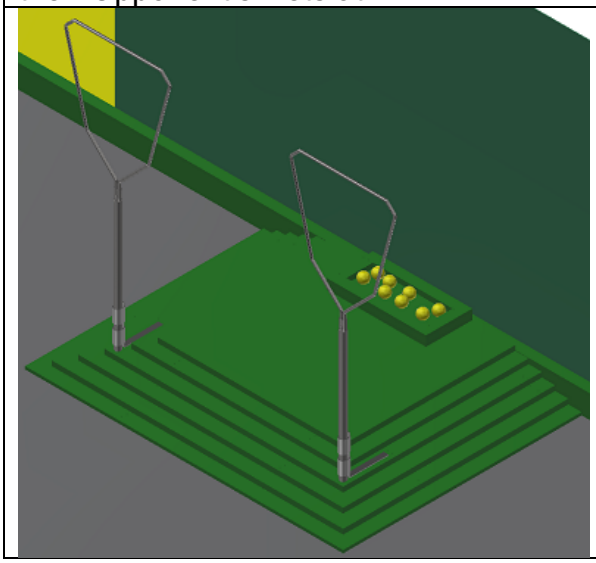
1.1. Tele-Operated Robot Elements are elements under the direct/active control of competitors during game play through the use of one or two radios/game controllers held by the courtside competitors

1.2. 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.

1.3. 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 Stationary 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.

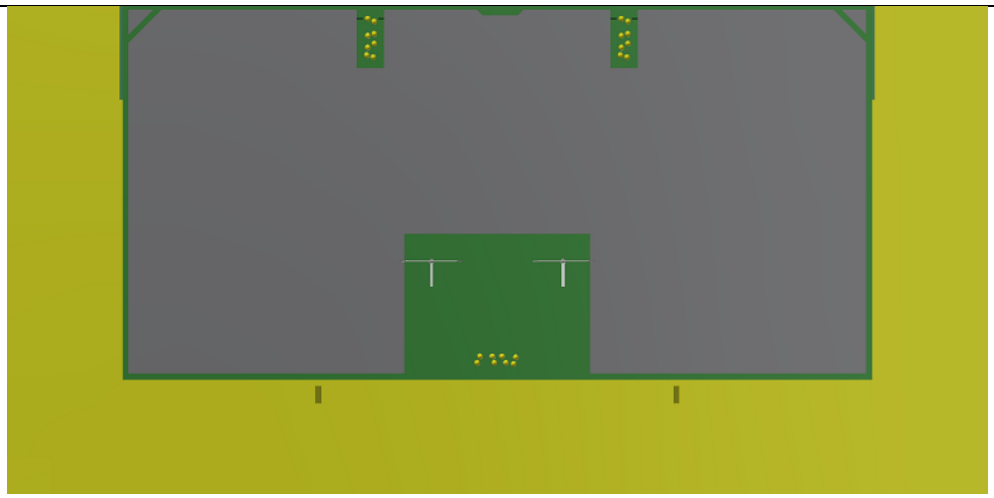
2. The Dueling Citadels Teleoperation Game Overview

The core game situation requires a Robot or Robots to deliver Soft Golf Balls into their Opponent's Nets at:



Stationary Nets positioned at the Front Corners of their Opponent's Citadel Hill, and,

	Free Rotating Nets mounted on the back of their Opponent's Robot. Fully / physically blocking the "nets" is not be in the spirit of the game and is not allowed.
 https://www.amazon.ca/PrideSports-Practice-Balls-12-Count-Yellow/dp/B00466W9X0/ref=sr_1_3?s=sports&ie=UTF8&qid=1527010522&sr=1-3&keywords=foam+golf+balls	Teams have use of Thirty Soft Practice Golf Balls: (a) Each Team's Robot Entry starts the game in possession of Six Soft Practice Golf Balls (b) An additional 24 Soft Practice Golf Balls are available to teams in three boxes positioned in their exclusive use court space a. 8 Soft Practice Golf Balls in each of 2 boxes in Fixed Positions on the court floor along the Center Wall, and, b. 8 Soft Practice Golf Balls in a box positioned on top of their own Citadel Hill. (c) Teams can NOT reposition the On the Court Floor Ball Boxes during game play. (d) The On Top of Citadel Hill Ball Box will be fixed in place (e) Robots MUST be on top of their own team's Citadel Hill when they are retrieving balls from the On Top of their Citadel Hill Ball Box.

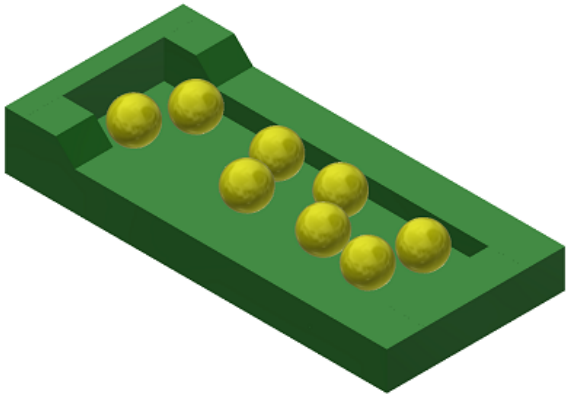


Each Team's Exclusive Use Area is approximately 8 ft. by 16 ft.

- Teams have Exclusive Use of a 30 in. wide passageway along three sides of their assigned court area.
- Both Team Members can be active in and move throughout this entire team passageway space during game play.
- It is a Team Responsibility to define the tasks assigned to each competitor.
- If a Team has a Two Robot Entry, then:
  a) Both competitors can be Robot Drivers
  b) Both competitors can also be Spotters for their partner driver
- If a Team has a One Robot Entry, then:

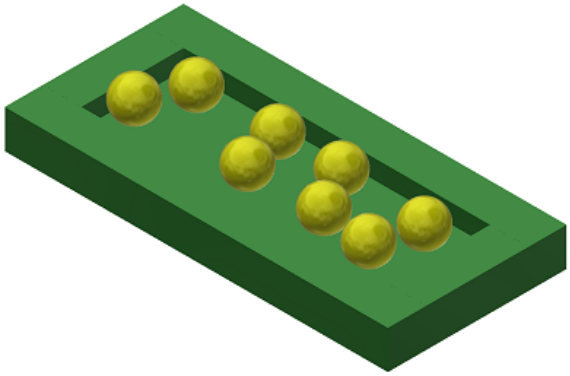
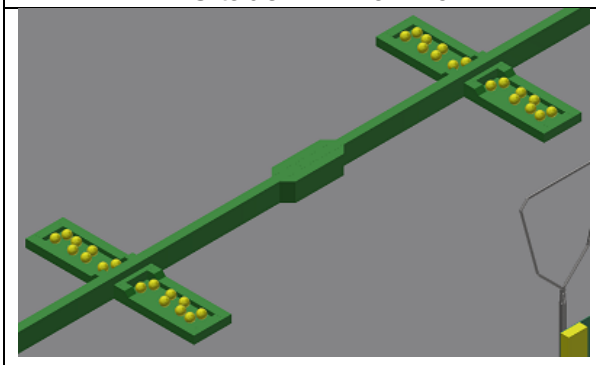
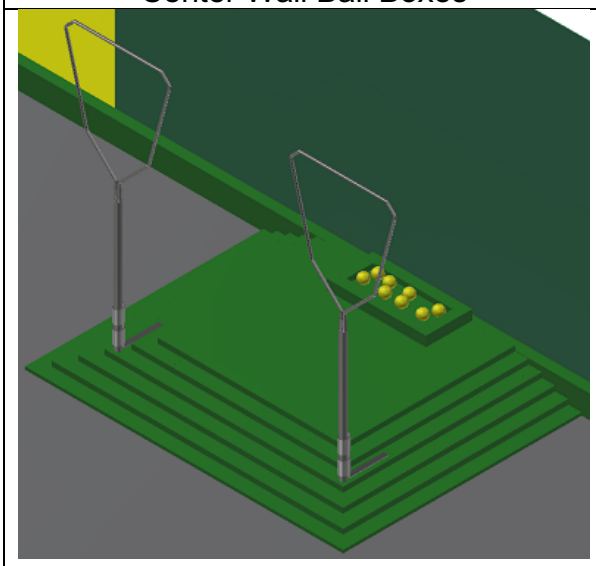
One competitor can be the Robot Driver and One competitor can be a Spotter for their partner driver

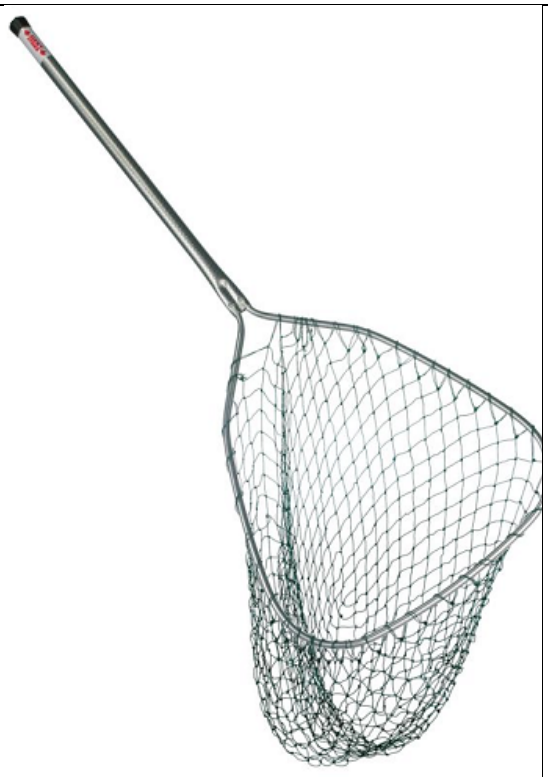
3. Performance Environment (Court) Features

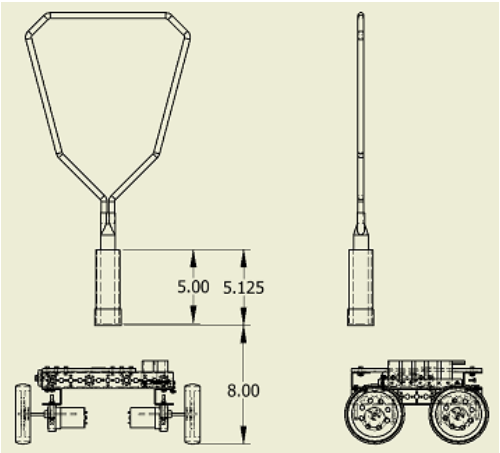


Court Floor Ball Box

- Two Court Floor Ball Boxes 15 by 7 by 0.75 in along three sides.
- Court Floor Boxes are fixed in place along the Center Wall
- There are EIGHT Soft Practice Golf Balls in each Court Floor Box at the start of the game

 Citadel Hill Ball Box	• One Citadel Hill Ball Box 15 by 7 by 0.75 in. • Citadel Hill Ball Boxes ARE fixed in place and CANNOT be moved by robots during game play • There are EIGHT Soft Practice Golf Balls in each Citadel Hill Box at the start of the game
 Center Wall Ball Boxes	• Each Center Wall Ball Box is 15 by 7 by 0.75 in. • Both Center Wall Ball Boxes ARE fixed in place and CANNOT be moved by robots during game play • There are EIGHT Soft Practice Golf Balls in each Center Wall Ball Box at the start of the game
 Citadel Hill	• The Citadel Hill Base is 36 by 48 in. • The Top of the Citadel Hill is 26 by 28 in. and is 4.5 in. above the court floor • There are Five Steps leading to the Top of the Citadel Hill and each of these steps has a 2 in. Run and a 0.75 in. Rise • Tall Fish Nets are positioned in holes at the Right and Left Front Corners of the fourth step • There is a 4 by 8 ft. by 0.125 in. Hardboard Wall along the back of the hill

	Citadel Hill Nets: Lucky Strike LS Econ Boat Net Canadian Tire Product # 78-4053-6, $15.99
	On the Robot Nets: Lucky Strike Economy Trout Net Canadian Tire Product # 178-2010-2, $9.99 **NOTE:** Competitors are required to remove the String Loop attached to the Trout Nets **BEFORE** installing these nets on their robot.



Teams mount a Trout Net on their robot.

- In a 5 inch 1.5 Dia. Vertical Abs Pipe that has an End Cap closing the bottom of the pipe
- The Net Holder must be positioned at the Mid-point along the back side of the robot
- The Bottom of the Net Holder must be 8 inches above the court floor
- The Net must be able to rotate freely through 360 degrees **at all times** while it is in the net holder
- The Net Holder and the structural supports required to hold it in place WILL NOT be included when calculating a Robot's Overall Size

Note: Competitors will participate in BOTH the Teleoperation Dueling Citadels Game and the Built On-site Autonomous Robot Tasks during BOTH Competition Days.

4. Teleoperation Dueling Citadels Game Description

- Games will involve Two Teams at a time.
- Both Competitors are allowed unrestricted movement around the perimeter of their Team's Assigned Court Area.
- Teams can utilize a Maximum of 2 Tele-operated Robots.
- Teams may also have one Independent Autonomous Element as part of their entry (which must fit into the overall size limitation at the beginning of the game).
- Teams will be in possession of SIX Soft Practice Golf Balls at the Start of a Game. (e.g. if two robots…3 balls in each).
- Each Team's robot CAN be in possession of an Unrestricted number of Soft Practice Golf Balls at any time once the game starts.
- Robots CAN shoot into **ANY** net from anywhere in their exclusive use space.
- Teams can incorporate defensive or offensive strategies. However, Teams may **NOT** assert control over balls in their opponent's exclusive use space. For example: A robot may **NOT** reach into the competitor's space to physically take possession of or move balls this includes **NOT** being allowed to use an air flow to move balls in your opponent's area.
- Teams can not intentionally remove balls from the playing area (shooting balls at nets where the ball goes out of the area does not constitute intentional

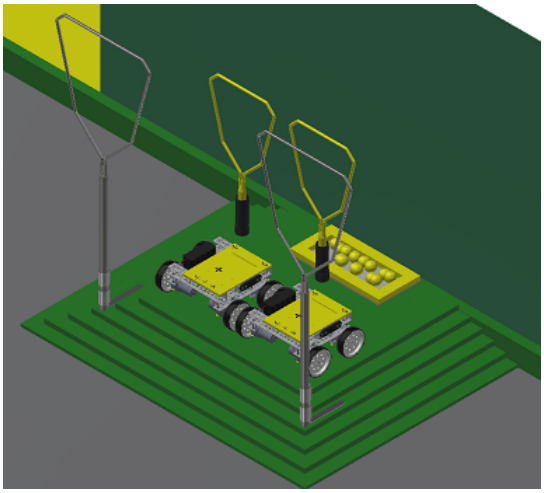
removal of balls: Teams intentionally removing balls out of the court area will be penalized with a 3 point loss per ball)

- Mobile nets must be able to move freely in a 360 degree rotation at All Times during game play.

5. Scoring Summary

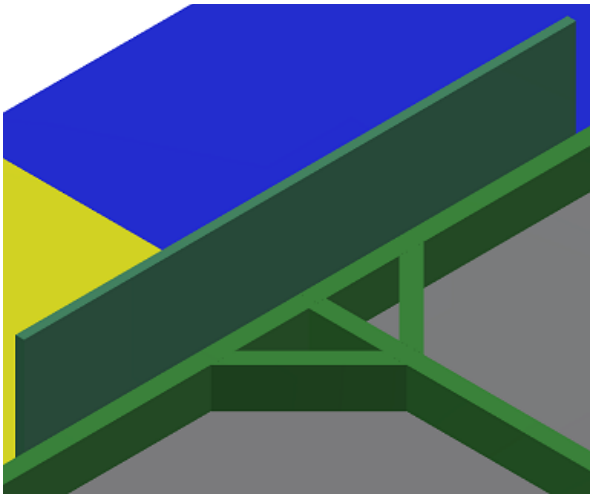
Scoring will be done at the end of each 3 min. match:

a) Teams must score a Minimum of ONE point as a direct result of their robot's actions to be declared a game winner.
b) 3 points will be awarded for each ball in the opponents "mobile/on the robot" net
c) 2 points will be awarded for balls in the opponents "on the citadel" nets
d) 1 point will be awarded for each ball that lies on the floor of the opponent's court space
e) 1 point will be awarded, for your opponent, for each ball that your robot is holding at the end of the game
f) 0 points will be awarded for each ball that is in the ammo boxes
g) 10 points will be awarded if ALL Robot(s) in a team's entry that are carrying a Trout Net, have travelled down OFF their Citadel Hill during game play and have returned to the Top of their Citadel Hill before the end of a game buzzer.



A Team's Entire Entry **MUST** be positioned **ON TOP** of their Home **Citadel Hill** at the Start of each Game.

The outer edges of the Citadel Hill Top Plate establish a set of Perimeter Vertical Planes that No Part of a robot can be breaking at the start of a game.

	Balls that land inside the Triangular Spaces formed by the center wall and the center wall's braces are considered 'Out of Play' and have Zero Point Value.

6. Pit Area and Court Access

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

Teams MUST bring their Robots into the skill area at Orientation. Teams are NOT 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.

Laptops may be removed overnight by competitors.

7. Tournament Play

7.1. Competitors must wear Safety Glasses when they are in the Teleoperation Court Area.
7.2. Dueling Citadels Game Tournament will be based on an 'Unseeded Tournament Format'.
7.3. Dueling Citadels Tournament Standing will be based on total number of Game Wins and Losses in all games played by each team.
7.4. Teams will play in an equal number of Tournament Games.
7.5. Teams will participate in an equal number of games against each opponent Team.
7.6. There will be no Dueling Citadels Playoff Games
7.7. Tournament games will last 3 minutes
7.8. 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.
7.9. Between tournament games, battery changes and repairs to robots may be completed at the team's assigned Pit Area Worktable.

7.10. During game play, referees will have ultimate authority over game rulings, and will have full authority over team conduct in the court area.

7.11. 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 is considered to be BREAKING court components. Robots bumping into court components and causing them to shift position without breaking any court element will NOT be considered to be damaging the court. It is expected that all court components will be fixed firmly in place so that the court is a Neutral Factor in the competition.

7.12. 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 make adjustments to their robot during a game.

7.13. 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 authorize the shutting off of 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.

7.14. It is a Team Decision what roles team members will fill. Drivers are the competitors holding the robot controller and asserting direct control over a Tele-operated robot.

7.15. The Spotter would be the competitor providing navigational guidance to the driver.

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

7.17. Competitors (Driver/s and/or Spotters) can move freely in their Assigned Courtside Team Area throughout the game.

7.18. Competitors may **not** enter an opponent team's Assigned Courtside Team Area at any time during game play.

7.19. At the start of a game, robots are expected to be in their Designated on top of their Citadel Hill Starting Positions.

7.20. Robots arriving AFTER a game has started will be allowed to enter the game in their designated on top of their Citadel Hill Starting Positions and use the Time remaining in the 3 minute game.

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

7.22. It will be a referee's ruling that decides if an 'End of the Game Shot' took place before or after the game-ending buzzer sounded and whether a robot is located completely on the top of its' Citadel Hill when the game-ending buzzer sounds.

7.23. If a Soft Practice Golf Ball lands out of the court, it may not be retrieved and will be out of limits of play.

7.24. Scoring will take place after the End of the Game Buzzer

8. Court Layout

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

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

- The open court surface will consist of the good side of Plywood Sheets **OR** the facility floor **OR** the smooth side of Masonite Sheeting.

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

9. The Robot(s) Restrictions

All elements of a team's entry, both autonomous and 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.

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 of their scheduled games until they have corrected the problem.

10. Start of the Game Robot Status

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

- Robots must be stationary
- Robots must be in their designated On Top of their Citadel Hill Starting Location.
- If Team Entries involve multiple Robots / Mechanisms then all of them must be placed in the designated starting location and must be positioned to not exceed the allowed total 4 cubic feet volume per Team.
- All systems may be ON.
- Air System Circuits may be fully charged to 100 PSI and their compressors can be ON.

11. Overall Team Robot Entry Size

11.1. Complete Team Entries must not exceed an overall size of **4 cubic feet** (6,912 cubic inches) at the start of each game.

11.2. Team Entries may expand to a larger size once a game has started.

11.3. Overall Team Entry Size will be calculated by using the maximum single dimension in each category (Length / Width / Height) of the Complete Team Entry not average dimensions.

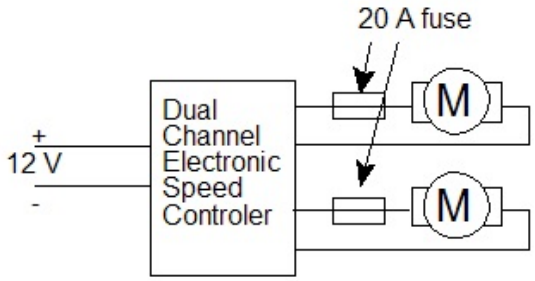
11.4. This overall size maximum will allow Team Entries to be any variation / combination of elements that does not exceed **6,912** cubic inches, using the following formula: Volume = Length x Width x Height

12. Power Sources / Management

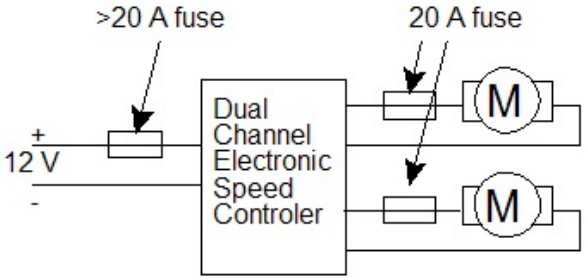
12.1. The total voltage in any individual circuit **cannot** exceed **24 Volts**.

12.2. 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)**



12.3. Teams are reminded that it is the purpose of a fuse to protect the students themselves and the equipment in their circuits. Teams must develop circuit diagrams, and calculate the appropriate values for all circuits on their robot. Teams must submit a wiring diagram of their robot's circuits.

12.4. 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.

12.5. Batteries must be complete sealed commercial battery packs.

12.6. ALL Robots must be able to be turned off with a single motion.

12.7. Robot Controller receivers may be in an independent circuit.

13. Non-Electrical (Battery) Energy Sources

13.1. 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.

13.2. Air pressure systems using Competitor-made or modified air pressure hardware are **NOT** permitted.

13.3. All pressurized tanks on robots must have a pressure gauge to indicate the stored pressure and a form of automatic overpressure safety relief system.
13.4. The pressure tanks and related gauges / controls must be shielded from damage due to collisions or flying target objects.
13.5. The stored pressure in the tank must not exceed a maximum of 100 PSI at any time.
13.6. 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.

14. Recommended Robot Controllers

14.1. It is recommended (not required) that all teams use 2.4 GHz "non-crystal" control systems on Tele-operated Robots.
14.2. Teams are allowed the use of an unlimited amount 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.
14.3. 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.)

15. Pit Area

15.1. Competitors MUST wear safety glasses when doing fabrication work involving material removal processes (grinding / cutting).
15.2. Only registered competitors are permitted in the contest space.
15.3. 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.
15.4. Designated teacher/industry team advisors are **not** allowed in the pit area during tournament play.
15.5. Teachers and industry advisors are not permitted to handle tools or robot parts. Students must affect all repairs and modifications on their robot.
15.6. Teams will be provided with a pit area workspace on a standard project table.
15.7. 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.

16. Overall Court Description:

16.1. The Court Playing Surface will be a 16' by 16' square.
16.2. Individual Exclusive Use Team Spaces are 8' by 16' rectangles.
16.3. The Perimeter Court Walls will be made using 2 by 4 inch planks.
16.4. This wall will as a result be approximately 3.5 inches tall.
16.5. The court surface may vary between melamine, concrete, hardboard, or plywood.

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

- ❑ Mandatory Wiring Diagram provided.
- ❑ Table Top Robot Stand
- ❑ Overall volume ≤ 4 ft^3 or 6,912 in^3
- ❑ No explosives/combustibles
- ❑ No lasers
- ❑ No Arial Robots
- ❑ All batteries are sealed commercial batteries in good physical condition
- ❑ Batteries wired in series should be the same amp hour rating (ex. both 1500 mAh) and batteries in parallel are of same voltage (ex. both 12 volts).
- ❑ Batteries securely mounted
- ❑ Total voltage in any individual circuit does not exceed 24V
- ❑ No circuit **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 is able to be turned off with a single motion**. Radio receivers / Logic circuits may be independent of the kill switch.
- ❑ Control unit to support operator to robot communication are being used.
- ❑ Demonstration of robot functionality

Additional concerns:

Robot Evaluator Signature | Team Representative Signature

18. Autonomous Competition Overview:

18.1. Competitors will be provided, at no cost to the teams, with a kit distributed to them through their provincial/Territorial office.

18.2. The autonomous robots must be disassembled on arrival.
18.3. A description of the Competition Component Collection will be posted on the Skills/Compétences Canada Website.
18.4. Competitors will build on-site Autonomous Robots using the provided common set of components.
18.5. Competitors will demonstrate their robots performance in a court to be defined at the Skill area.
18.6. At the orientation meeting, Competitors will be told the specific Robot Behaviors their Built On-Site Robots need to complete.
18.7. The suggested performance items listed below reflect the type of core isolated robot performance elements competitor robots will need to complete

- Follow wall perimeter,
- Navigate a maze,
- Navigate around obstacles,
- Follow a colored tape line on the floor,
- Locate and touch an object
- Pick up a small object and move it to a new location

18.8. Competitors MUST understand the list above represents **samples ONLY** and does not present a final or complete list of the potential robot behaviors they might be asked to create.
18.9. Teams need to develop an understanding of the performance capabilities of ALL components in the Competition Collection and prepare to be able to use any of these components effectively.
18.10. Competitors need to be prepared to go beyond the initial single stage performance requirements to multi-stage performance requirements as the culminating end of the competition experience.
18.11. Build On-Site Autonomous Tasks Equipment: Competitors will be required to build their autonomous robot solutions using **ONLY** the contents of the provided to all teams 2019 Skills Canada Component Collection

19. Autonomous Competition Participation Format and Scoring

19.1. Teams will have time periods where they have shared access to the various Autonomous Performance Court Environments to conduct their Task Solution / Preparation Activities
19.2. Teams will have a maximum of Three Marked Attempts at each of the Autonomous Performance Tasks
19.3. Marked Autonomous Task Attempts will be conducted on a 'By the request of the Teams Basis with a requirement that Teams complete ALL Autonomous Task Preparation Activities by an announced at the start of the competition Fixed Time: Example: All Autonomous Task Preparation Activities must end by 3:45 PM on Competition Day 2.
19.4. Team Marks will be based on their Best Performance out of their three attempts.

19.5. Teams will have time periods where they have shared access to the various Autonomous Performance Court Environments to conduct their Task Solution / Preparation Activities

20. Medals will be awarded based on Skills Canada's Computer Information System Requirements

20.1. Overall scoring of all marked competition experiences will equal 100 marks

20.2. No Individual Marked Item will have a value greater than 2 marks

20.3. All Marked Items will fit into one of the two available CIS categories: Measurement or Judgement

20.4. The following are samples of Items that fit into the Measurement Category.

Note: **These are only samples and they may not all be used in the Halifax Evaluation Experience. The specific marking pattern will be presented to the competitors during the In-Halifax competition orientation meeting.**

Measurement Marking Samples:

1. Individual Teleoperation Game Results
2. Total Number of Game Points Scored in each tournament quarter

Example: In a Tournament where all teams play 20 games

a) Total Points in games 1 to 5
b) Total Points in games 6 to 10
c) Total Points in games 11 to 15
d) Total Points in games 16 to 20

3. Successful Completion of Specific Individual Teleoperated Robot Performance Items

a) A Robot Carrying a Trout Net can drive down off the Citadel Hill onto the open court floor
b) A Robot Carrying a Trout Net can drive from a position on the open court floor up onto the top of the Citadel Hill
c) A Robot positioned on top of their Citadel Hill can successfully shoot a ball into one of their opponent's stationary Citadel Hill Nets
d) A Robot positioned in a location of the team's choosing on the open court floor can successfully shoot a ball into one of their opponent's stationary Citadel Hill Nets
e) A Robot can successfully retrieve a ball from their own on top of the Citadel Hill Ammo Box
f) A Robot can successfully retrieve a ball from their own on the court floor Ammos Box

21. The following is a description of sample Items that fit into the CIS Judgement Category.

Note: Judgement Marks in total will account for a **maximum of 10 out of the overall 100 marks**

Note: These are only samples and they will not all be used in the Halifax Evaluation Experience.

Note: The specific marking pattern will be presented to the competitors during the In-Halifax competition orientation meeting.

Judgement Marking Samples:

Relative to the Teleoperation Robot's

1. Compliance with the Mandated Robot Size Limitation
2. Master Safety Switch installation / functionality
3. Wiring Diagram
4. Robot's Wiring Installation Quality
5. Robot's Structural Design / Integrity
6. Robot's Mobility System Design / Integrity
7. Robot's Object Management System Design / Integrity

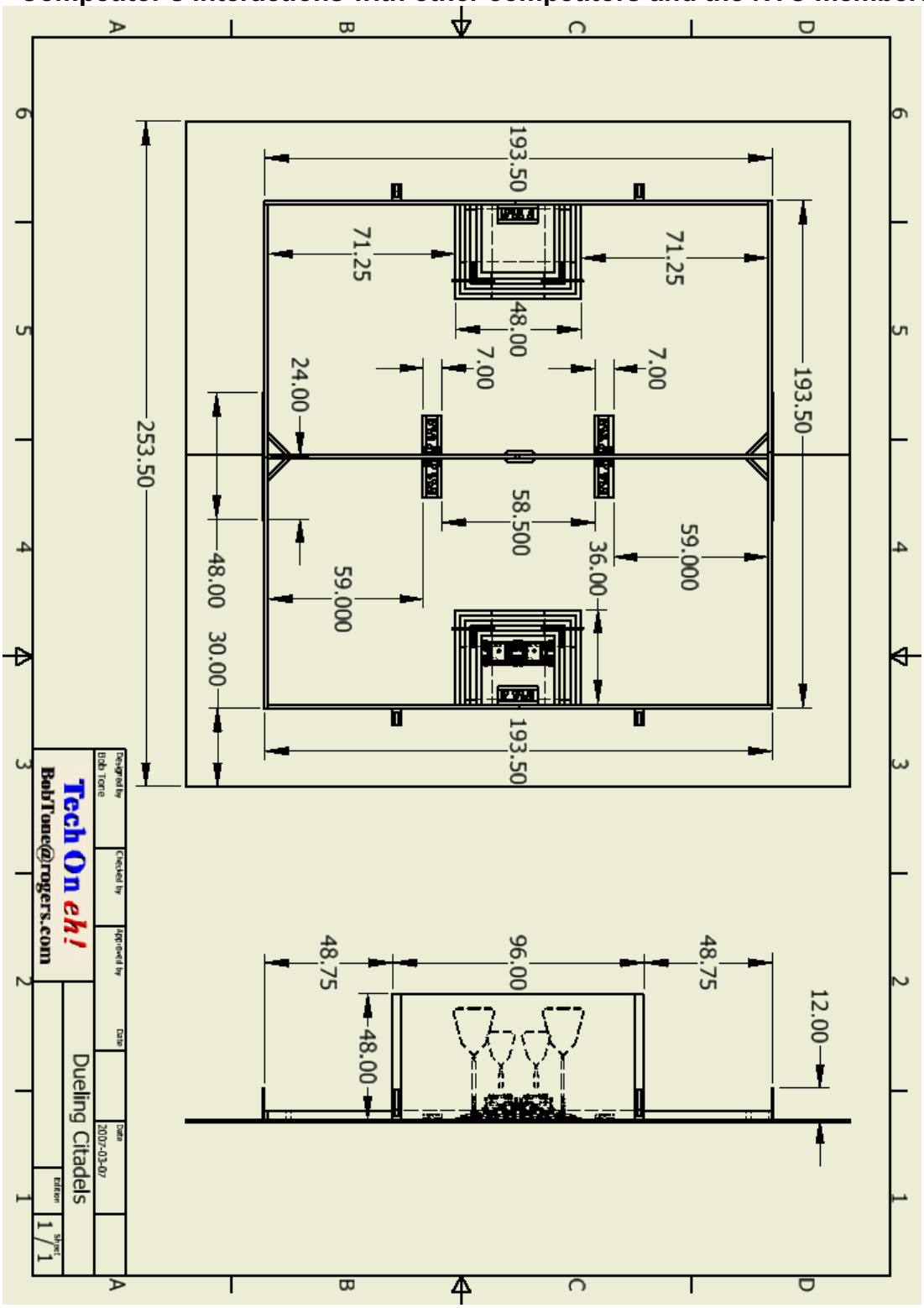
Relative to the Autonomous Robot's

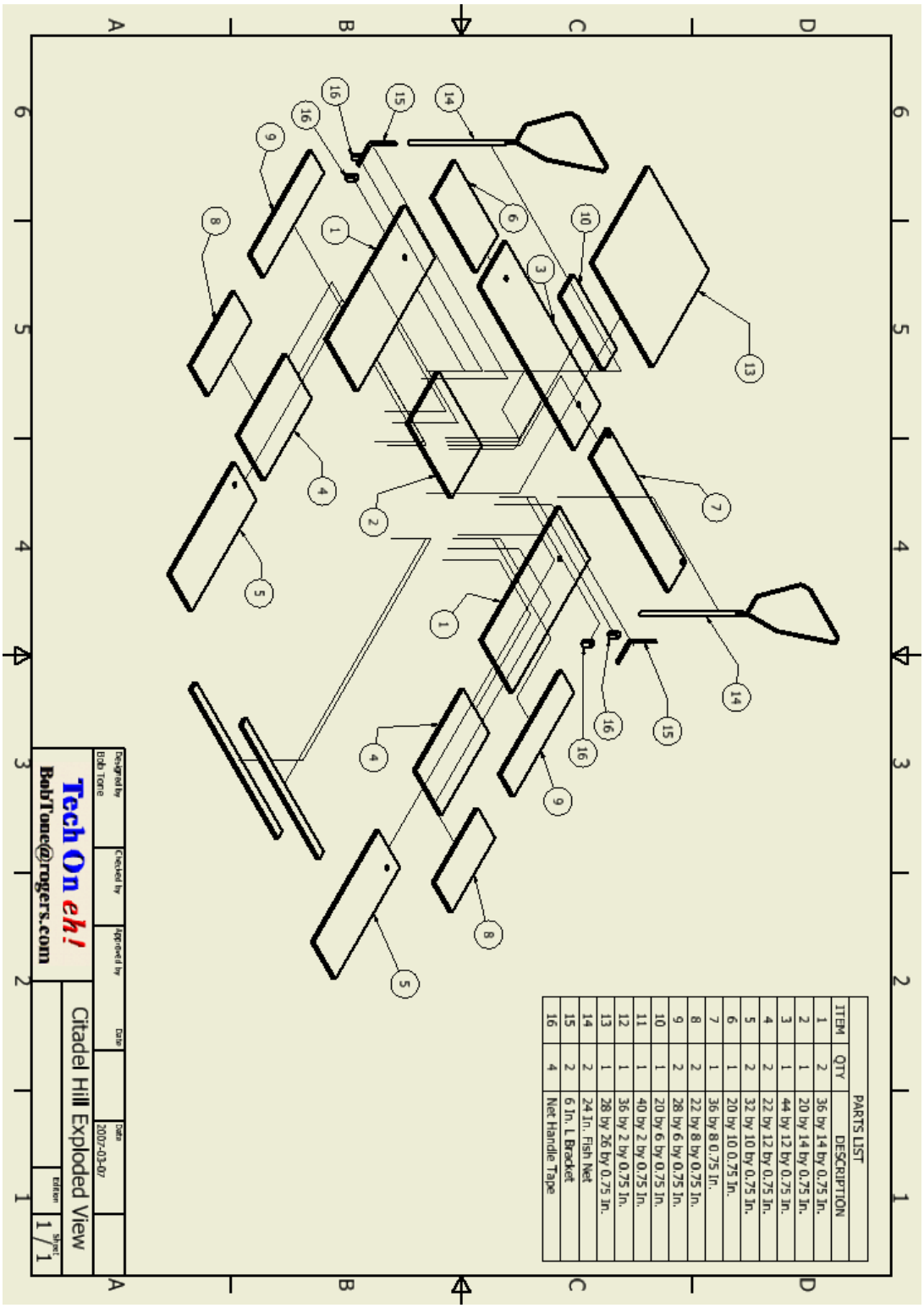
1. Compliance with the Mandated Robot Size Limitation
2. Utilization / placement of information gathering components on their robot
3. Robot's Wiring Installation Quality
4. Robot's Structural Design / Integrity
5. Robot's Mobility System Design / Integrity
6. Robot's Object Management System Design / Integrity

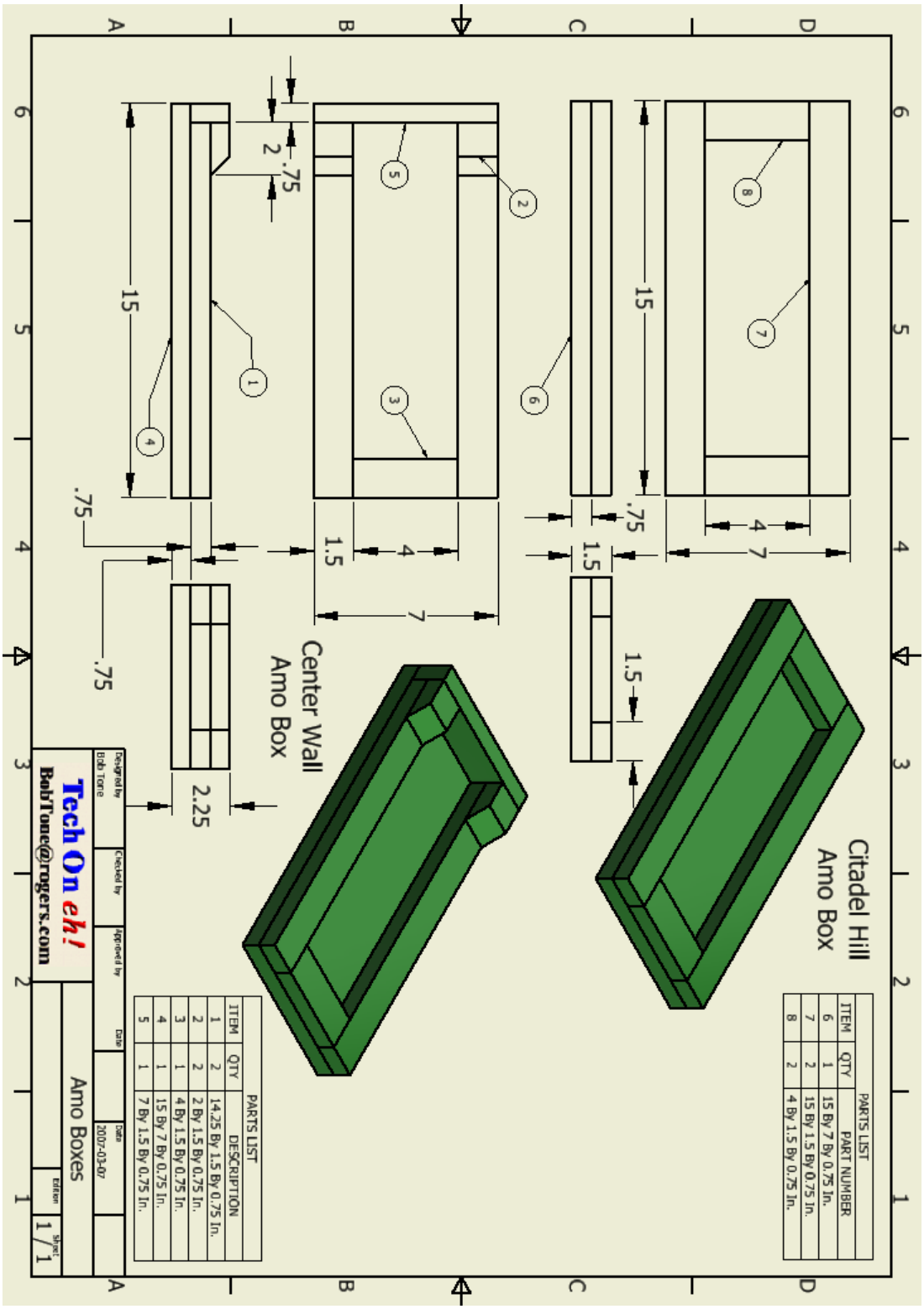
Relative to the Competitor's 'In the Competition Space' Performance

1. Team 'Pit Area Table' Management

2. Competitor's adherence to schedules
3. **Competitor's interactions with other competitors and the NTC members**




PARTS LIST
ITEM QTY DESCRIPTION
1 2 36 by 14 by 0.75 In.
2 1 20 by 14 by 0.75 In.
3 1 44 by 12 by 0.75 In.
4 2 22 by 12 by 0.75 In.
5 2 32 by 10 by 0.75 In.
6 1 20 by 10 0.75 In.
7 1 36 by 8 0.75 In.
8 2 22 by 8 by 0.75 In.
9 2 28 by 6 by 0.75 In.
10 1 20 by 6 by 0.75 In.
11 1 40 by 2 by 0.75 In.
12 1 36 by 2 by 0.75 In.
13 1 28 by 26 by 0.75 In.
14 2 24 In. Fish Net
15 2 6 In. L Bracket
16 4 Net Handle Tape
Designed by Bob Tone
Checked by
Approved by
Date
Date 2007-03-07
Tech On eh!
BobTone@rogers.com
Citadel Hill Exploded View
Edition
Sheet 1 / 1


Citadel Hill
Amo Box
Center Wall
Amo Box
PARTS LIST
ITEM QTY PART NUMBER
6 1 15 By 7 By 0.75 In.
7 2 15 By 1.5 By 0.75 In.
8 2 4 By 1.5 By 0.75 In.
PARTS LIST
ITEM QTY DESCRIPTION
1 2 14.25 By 1.5 By 0.75 In.
2 2 2 By 1.5 By 0.75 In.
3 1 4 By 1.5 By 0.75 In.
4 1 15 By 7 By 0.75 In.
5 1 7 By 1.5 By 0.75 In.
Designed by
Bob Tone
Checked by
Approved by
Date
2007-03-07
Tech On eh!
BobTone@rogers.com
Amo Boxes
Edition
Sheet
1 / 1