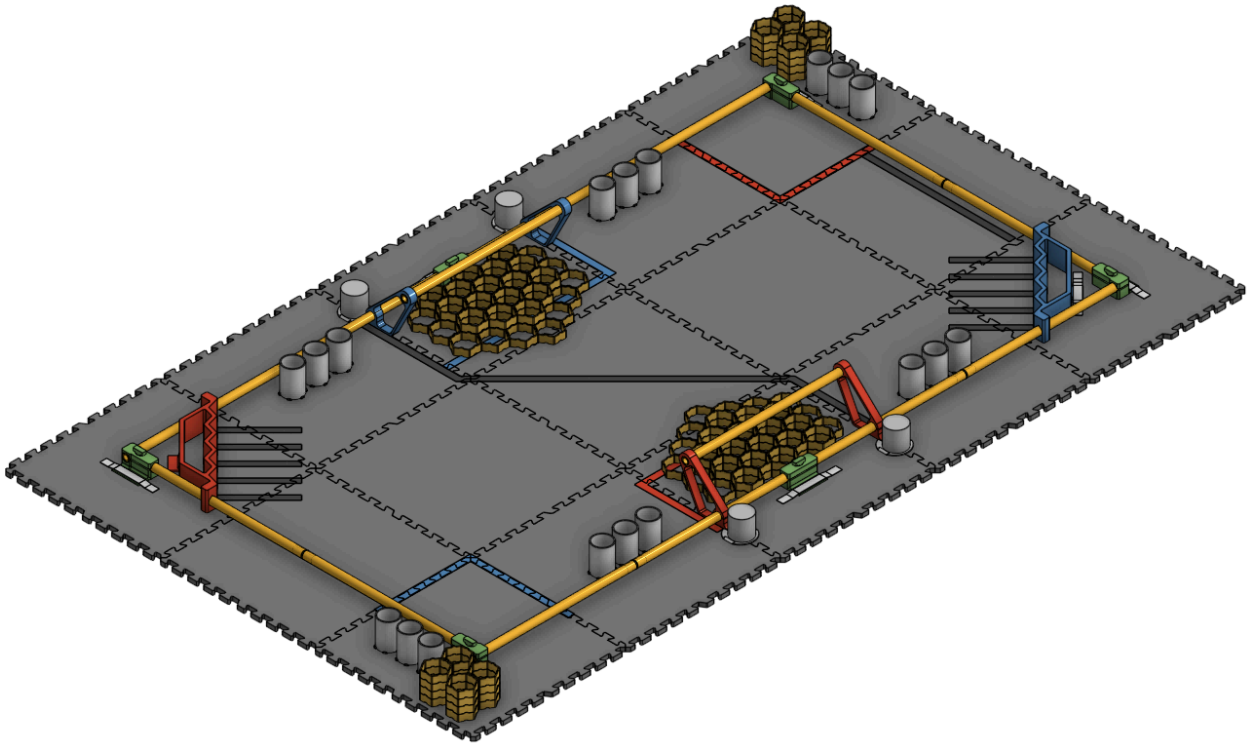
1. Game Overview

- Hive Rush is a head-to-head robotics game played by two alliances, each with two robots.
- Alliances score by collecting **Honey Combs**, assembling them using **Comb Structures**, placing them onto the **Hive Core**, and completing **End Game** objectives on the **Landing Bar**.

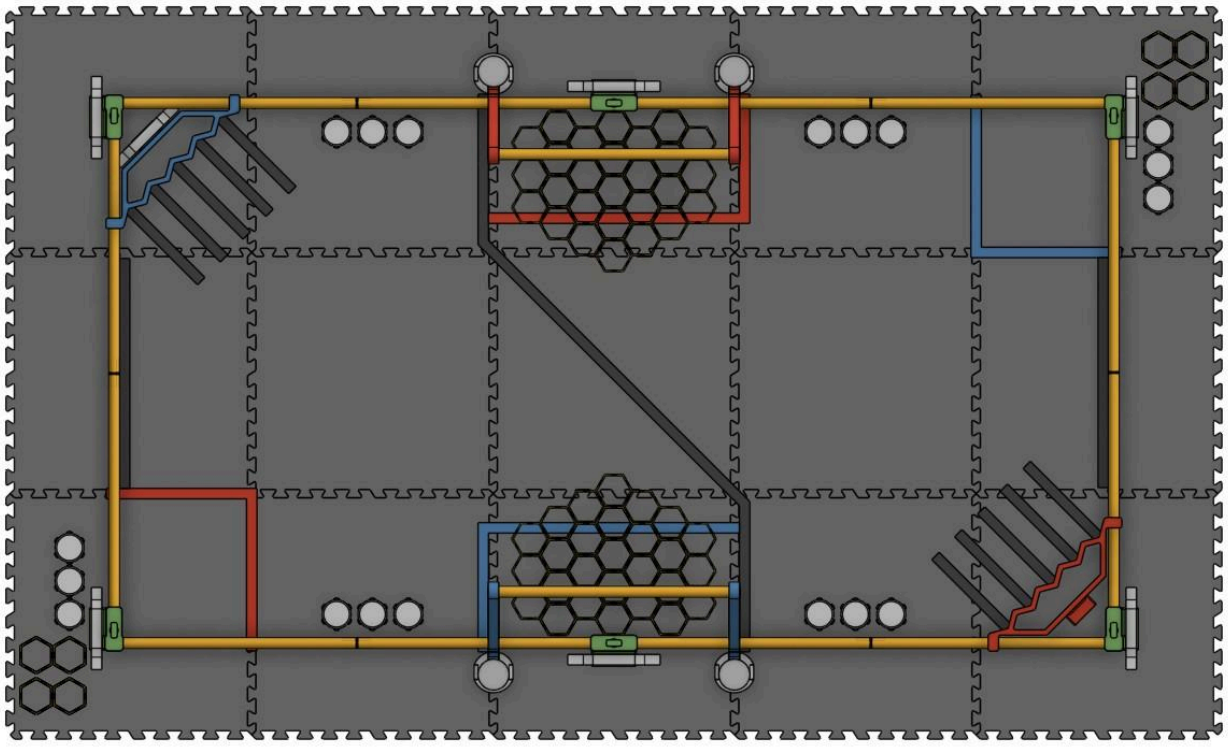
2. Field Description



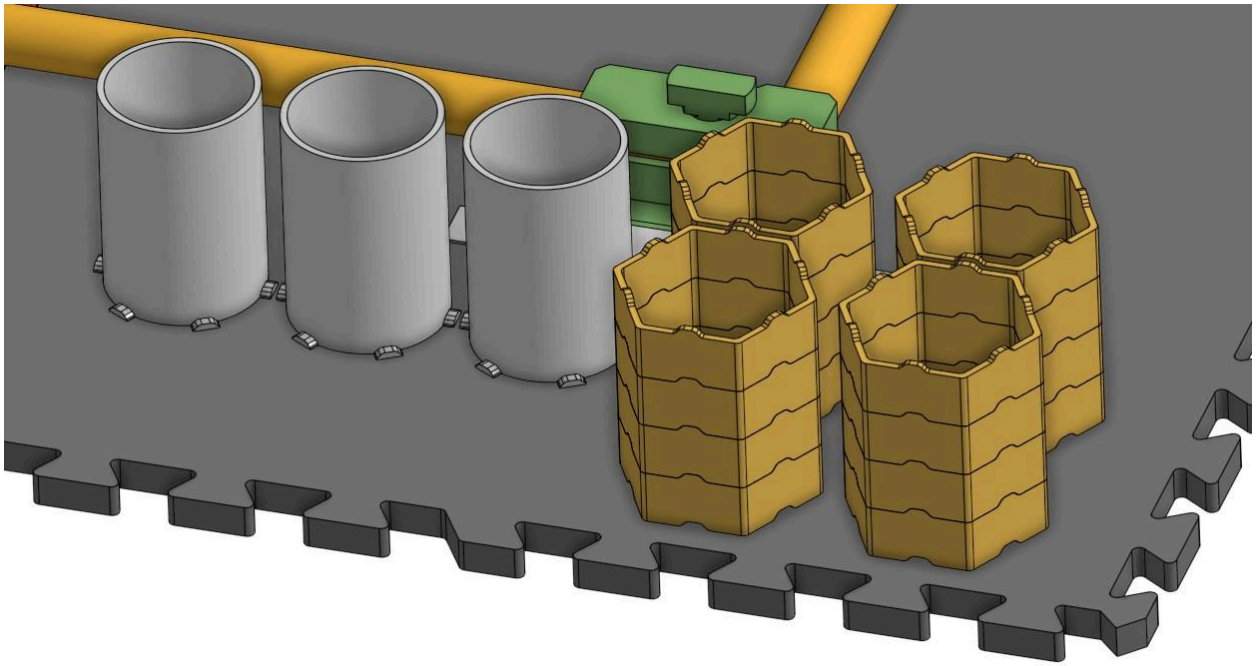
2.1 Field Size and Surface

- **Dimensions:** 51.25 inches wide × 96.05 inches long.
- **Surface:** Foam interlocking mats (3 mats wide × 5 mats long).
- **The Hive:** The entire playing area.

2.2 Field Setup

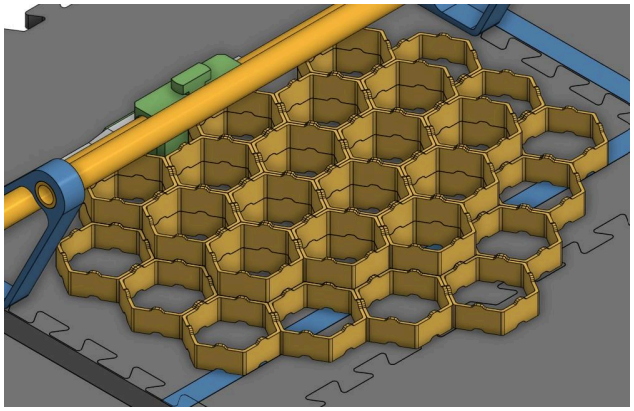


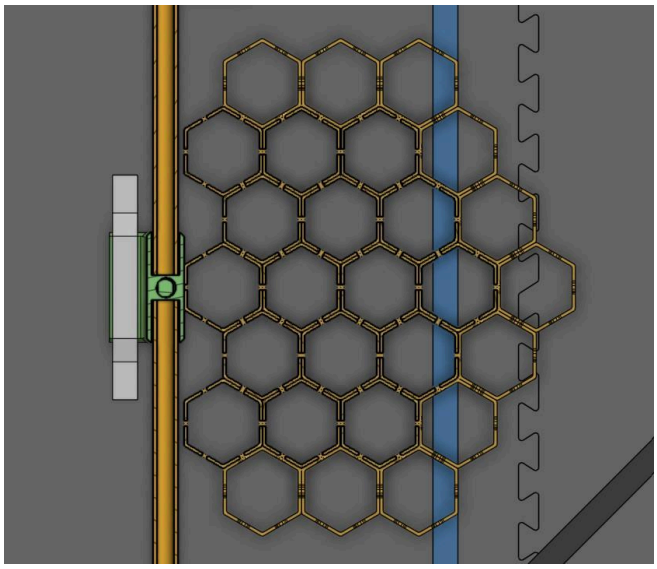
Human Players: Will start with sixteen (16) Honey Combs, and three (3) Comb Structures.



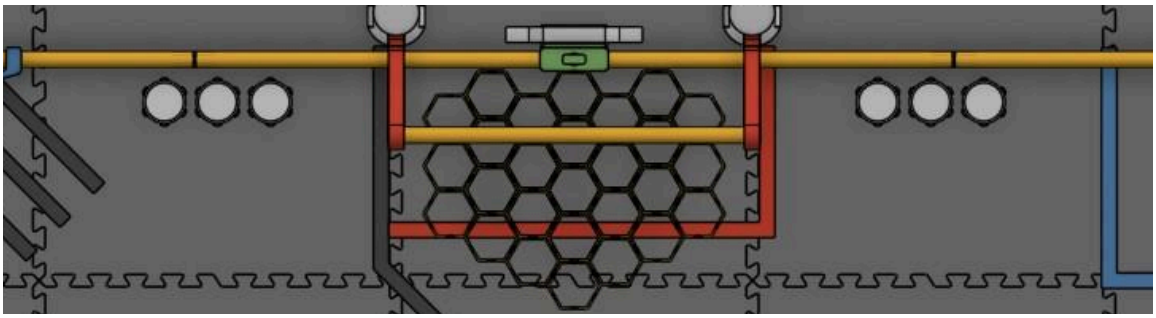
Field: Will start with eighty six (86) Honey Combs, and twelve (12) Comb Structures.

Honey Combs will have forty three (43) in each alliance landing zone. These are stacked with twenty seven (27) on the bottom level and sixteen (16) on the top level with single stacked honey combs surrounding the double stacks.





Comb Structures start with twelve (12) on the field. With six (6) in each alliance zone.

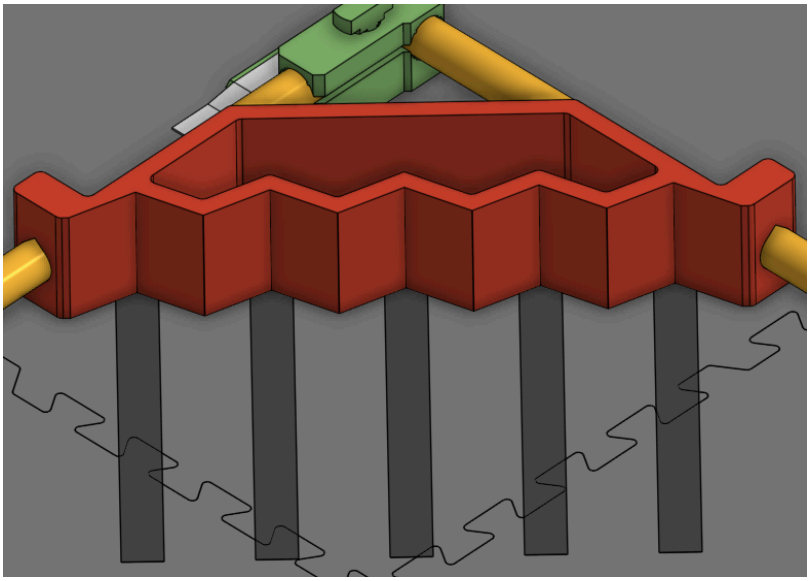


Robots: Robots may choose to start with up to two (2) honey combs.

2.3 Field Zones and Elements

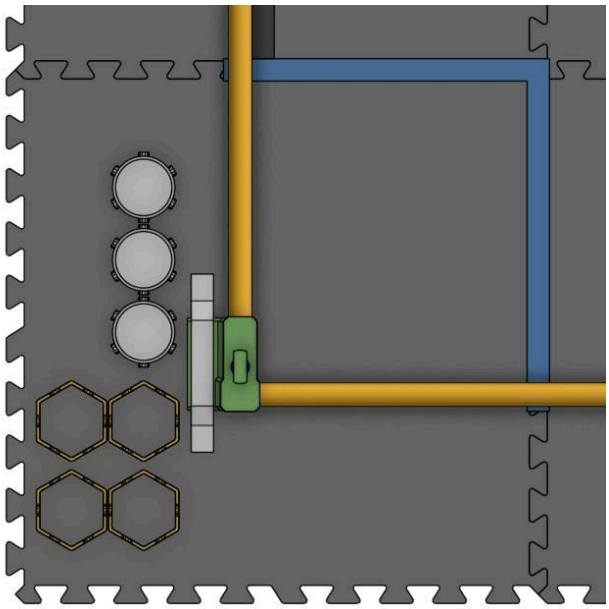
- **Hive Core:** Primary scoring goal.

The hive core has 5 starting spots for connected honey combs. This is on each opposing sides of the field. Each starting spot has a black tape line to help alignment.

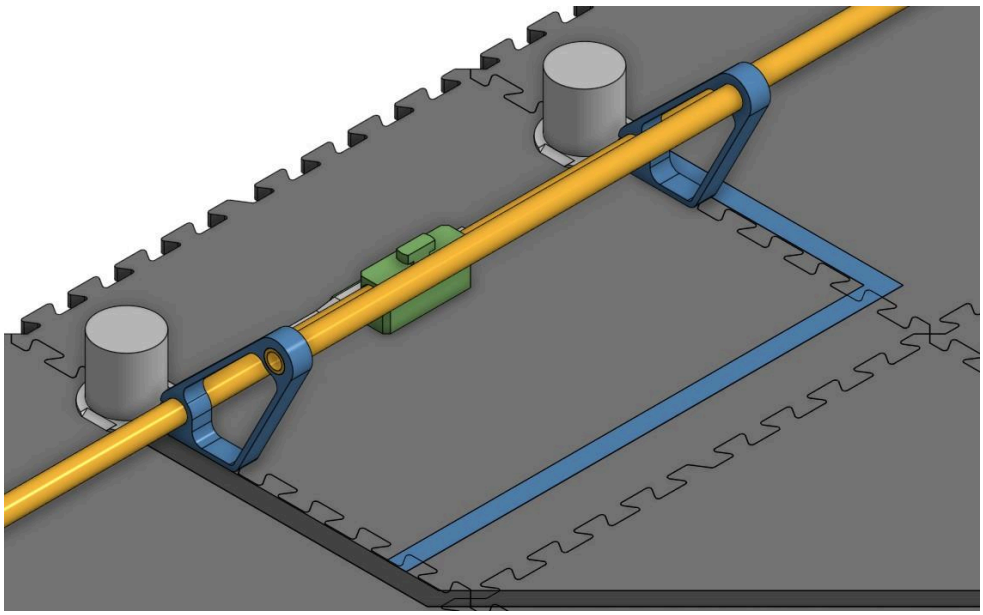


- **Hive Port:** Human Player Zone.

The hive port is roughly twelve by twelve (12x12) inches, and is a protected zone. This allows human players to introduce and receive game pieces from the field.

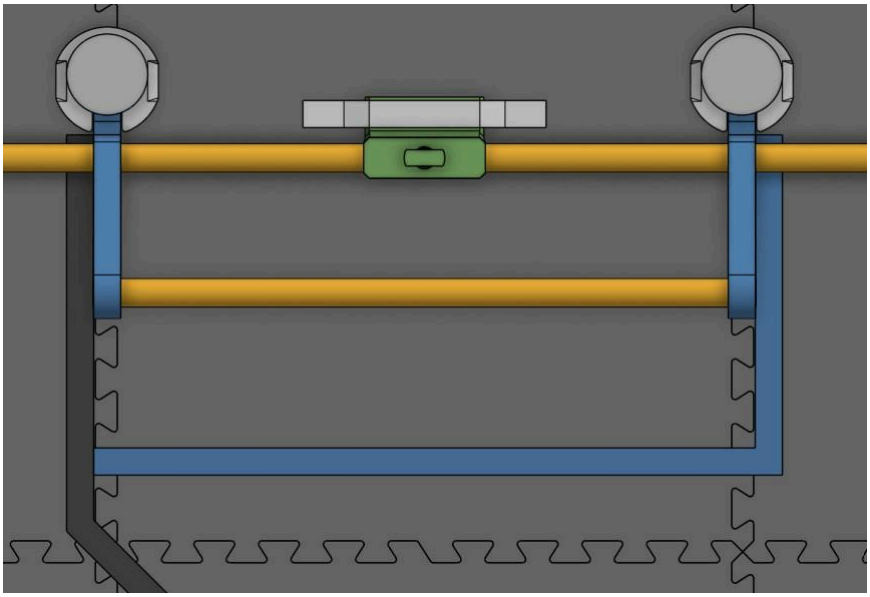


- **Landing Bar:** End Game hanging bar (6 inches from floor to center bar and 1.05 inches diameter).



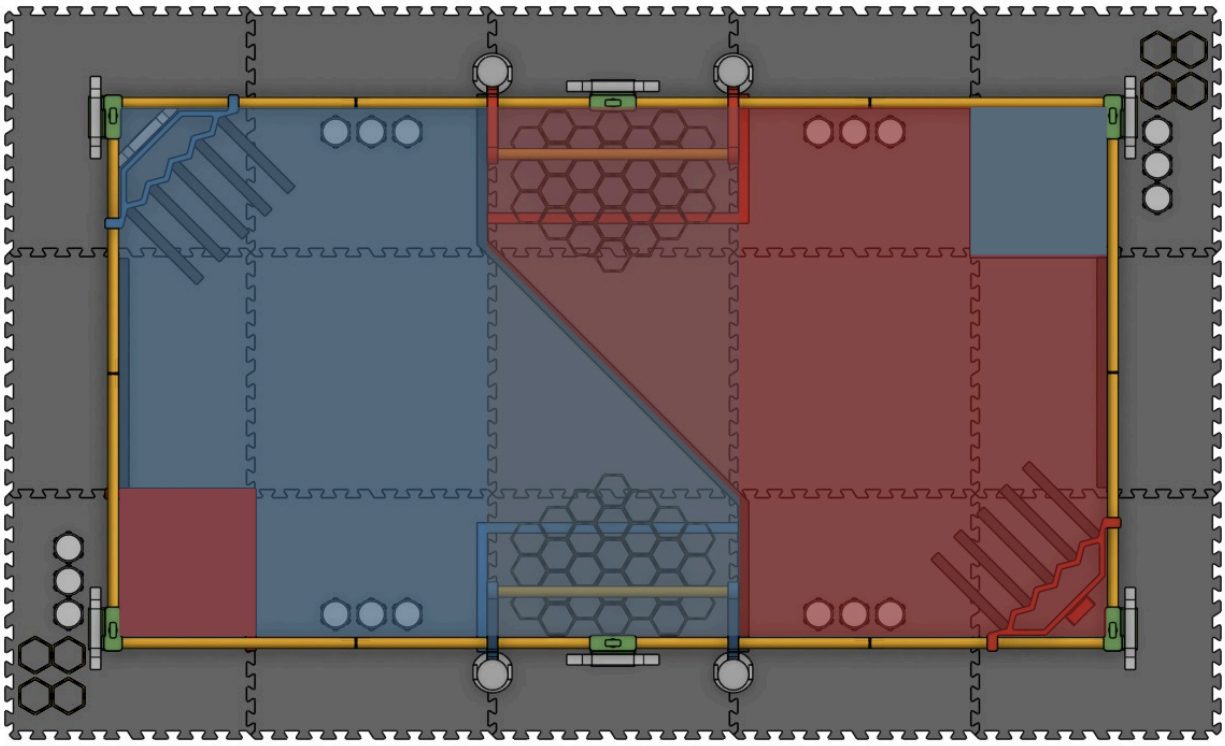
- **Landing Zone:** Area directly below the Landing Bar.

This area is 10x24.5. This zone is a protected zone during end-game.



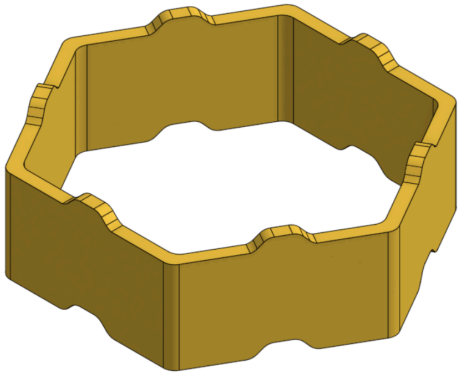
- **Alliance Zone:** One half of the field, divided by the center line.

During autonomous alliance zones are important. Robots must stay within the alliance zone during auto.



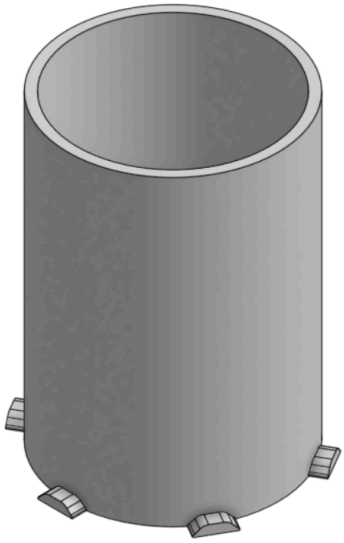
3. Game Pieces

3.1 Honey Comb



- Hexagonal game pieces; may be unstructured or structured.
- 118 total game pieces, 86 on the field, and 16 per human player
- The external constructed circle of the game piece is 3.14 inches and 1 inch tall minus the tab height.
- These score one (1) point when connected to the hive core.

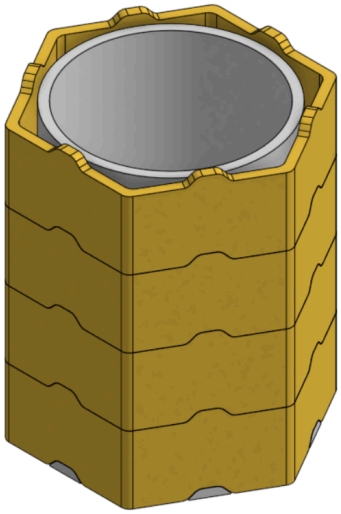
3.2 Structure



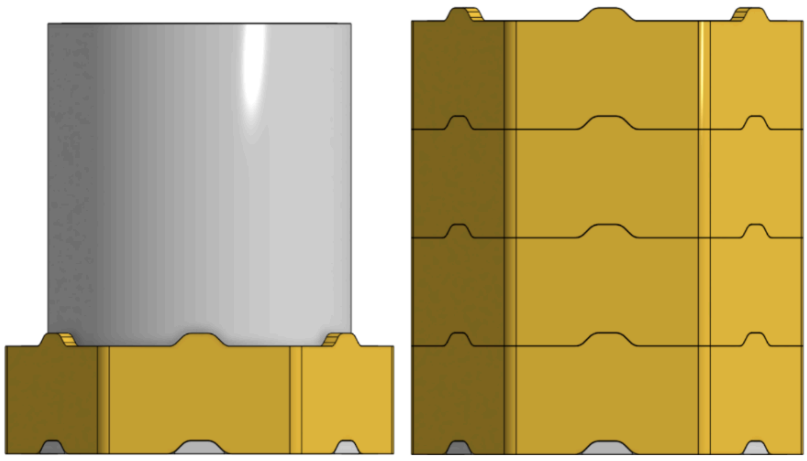
- Internal frames used to hold Honey Combs.
- Each Structure may hold up to four (4) Honey Combs.
- 18 total game pieces, 12 on the field, and 3 per human player
- This game piece is 2.8 inches in diameter and 4 inches tall
- These double any honey comb when inside and connected to the hive core.

4. Definitions

4.1 Structured Honey Comb



- Any Honey Comb placed on a Comb Structure.
- Honey Combs stacked without a Comb Structure inside are not structured.
- A Structured Honey Comb must have the minimum of one (1) honey comb stacked with a comb structure inside, and the maximum of four (4) honey combs stacked with a comb structure inside.
- Any additional honey comb stacked on top will not contribute to the doubling bonus.
- A robot may not carry more than one (1) structured honey comb
- If a robot carries a structured honey comb with more than four (4) honey combs, then the alliance will receive a minor penalty.

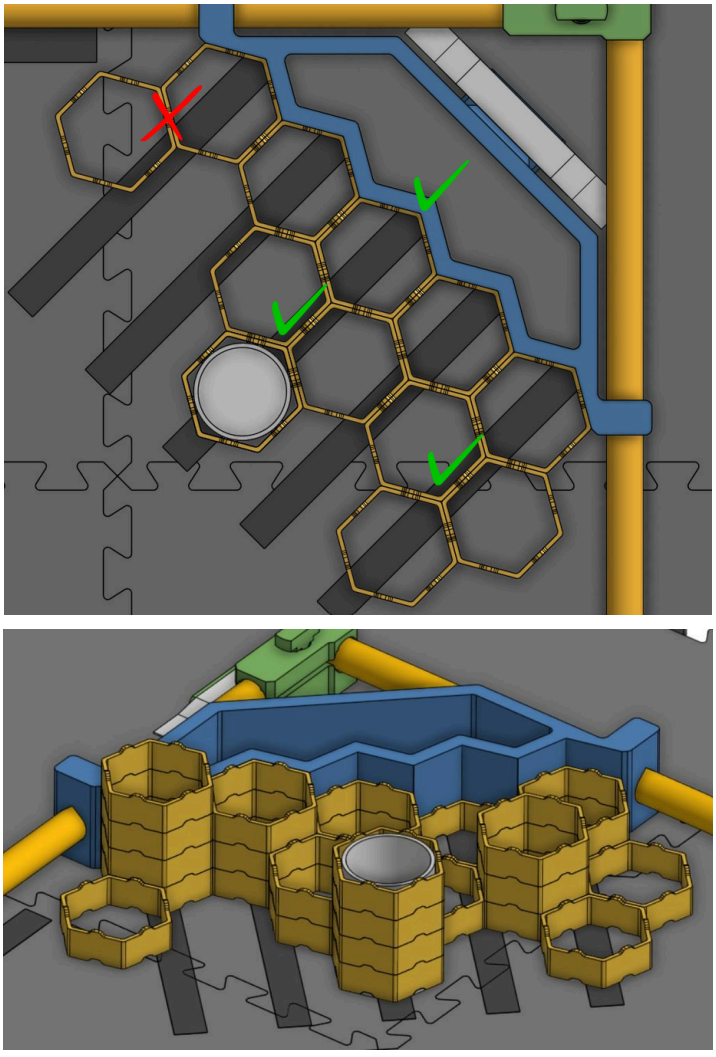


4.2 Carrying

- A robot is considered to be carrying a game piece if it is supported, constrained, or moved by the robot.

4.3 Connected Honey Comb

- A Honey Comb is considered Connected when it is fully seated and at least two flat hexagonal sides are in flush contact with:
    - The Hive Core, **OR**
    - Other Honey Combs.
- Contact with only one flat side, a corner, edge, or point does not count.
- There is no limit to how many honey combs connect horizontally or vertically.
- Connected honey combs may not block or enter into protected zones (hive port and landing zone).



Examples of Connected Honey Combs

5. Robot Interaction and Carry Limits

5.1 Carry Limits

- **Robots may carry one of the following:**
    - Up to two (2) unstructured Honey Combs, **OR**
    - One (1) Structured Honey Comb (loaded), **OR**
    - One (1) Structure (empty).
- **Robots may not:**
    - Carry unstructured Honey Combs at the same time as a Structure.
    - Carry additional Honey Combs beyond those placed on a Structured Honey Comb.
    - Carry more a structured honey comb with more than four (4) honey combs

5.2 Herding and Pushing

- Herding or Pusing is considered as a “Carry”.
- Repeated or intentional herding of more than two Honey Combs is a **Major Penalty**.
- A brief touch while acquiring or setting a game piece does not count as a Herding, pushing or carrying.

6. Human Player Rules

- Human Players may hold (outside the field): Up to 16 Honey Combs and up to 3 Comb Structures.
- Human Players may add Honey Combs to Comb Structures and place game pieces at any time during the match.

7. Scoring

7.1 Hive Core Scoring

- Each **Connected Honey Comb** scores **1 point**.
- Each **Structured Honey Comb** scores **double** (i.e., **2 points per Honey Comb**).
- There is no requirement to fully load a Comb Structure to score.

7.2 Connected Scoring Requirement

- Honey Combs must be **Connected** at the end of the match to score.

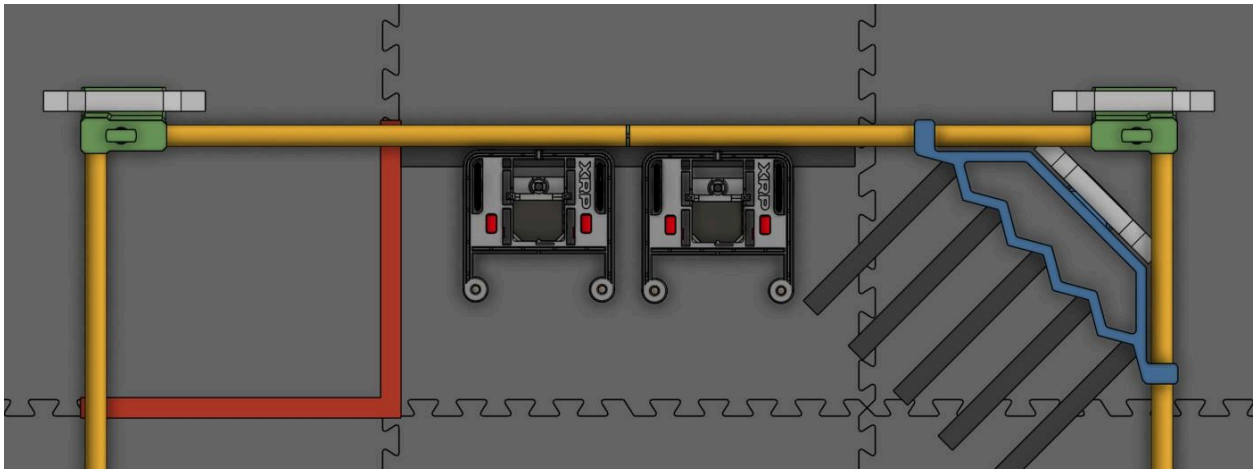
8. Autonomous Period

8.1 Autonomous Rules

- **Duration:** 15 seconds.
- Honey Comb scoring is **doubled**:
    - 2 points per Connected Honey Comb.
    - 4 points per Structured Honey Comb.
- Robots earn **5 points** for fully moving off the Starting Line.
- Robots may not cross the center line.

8.2 Starting Line

- Located on the alliance wall, positioned between the Hive Core and Hive Port.



9. End Game

9.1 End Game Timing

- Begins when the match timer displays 30 seconds remaining.
- The Landing Zone becomes a protected zone during End Game.

9.2 End Game Scoring

Robot State	Points
Parked in Landing Zone	5
Touching Landing Bar	10
Fully Hanging	15

9.3 Hanging Definition

- A robot is considered Fully Supported by the Landing Bar if it is supported solely by the Landing Bar, no part touches the floor/walls/game pieces/other robots, and it maintains this condition for at least 2 seconds after the match timer ends

10. Cooperation Bonus

- A **15-point** Cooperation Bonus is awarded if all four (4) robots are fully within their respective alliance Landing Zones at the end of the match.

11. Penalties and Fouls

11.1 Penalty Values

Penalty Type	Points Awarded to Opposing Alliance
Minor Penalty	5 points
Major Penalty	15 points

11.2 De-Scoring

- Intentionally or recklessly removing or displacing an opposing alliance's scored Honey Comb or Comb Structure.
- De-scoring is a **Major Penalty**. Each Comb removed will count as an individual penalty.

11.3 Pinning

- Pinning an opposing robot for more than 3 seconds results in a **Minor Penalty**.

11.4 Protected Zones

- Any contact initiated by an opposing robot inside a protected zone is penalized:
    - Hive Port (Human Player Zone): **Minor Penalty**.
    - Landing Zone during End Game: **Major Penalty**. (Only During End Game)

12. Match Timing Summary

Phase	Duration
Autonomous	15 seconds
Teleoperated	2 minutes
End Game	30 seconds
Total Match Time	**2 minutes 15 seconds**

13. Referee Authority

- Referees have final authority on all rule interpretation, scoring decisions, and penalties.
- All scoring determinations are made at the end of the match.

Robot Construction Rules

1. Robot Size and Weight Limits

1.1 Chassis Size

- The robot chassis must fit within a **maximum perimeter of 1000 millimeters**
- Perimeter is measured as the **sum of the outermost edges of the robot chassis** when viewed from the top
- The chassis may be any shape

Example:
A 250 mm × 250 mm square chassis has a perimeter of 1000 mm and is legal

1.2 Mechanism Extensions

- All robot mechanisms must **start within the chassis perimeter**
- Mechanisms may extend **no more than 50 millimeters beyond the chassis perimeter**
- Extensions are permitted in **only one direction at a time**
- Mechanisms may not rotate, shift, or reconfigure in a way that exceeds the 50 mm extension limit in multiple directions

1.3 Robot Height

- The robot's height may not exceed 200 millimeters
- This height limit applies:
- At the start of the match
- During the match
- Including all mechanisms, extensions, and attachments

1.4 Robot Weight

- The robot may weigh **no more than 5 pounds**, excluding batteries

- Weight includes:
    - Chassis
    - Motors
    - Controllers
    - Motor controllers
    - Wiring
    - Fasteners
    - All mechanisms and attachments

2. Materials and Electronics

2.1 Allowed Materials

Robots may use the following materials for custom parts:

- Wood
- Composites
- Plastics
- Rubbers
- Aluminum

2.2 Control System

- Robots must use **one (1) XRP Controller** as the primary robot controller
    - ROB-26619
- Robots may use **any I2C sensor** compatible with the XRP controller
- Additional microcontrollers or coprocessors are **not permitted**

3. Actuators and Motors

3.1 Servos

- Robots may use any generic servo motor
- Only **6V servos** may be connected directly to the XRP controller
- Servos requiring higher current must use an approved Servo Power Module:
    - REV Robotics Servo Power Module (REV-11-1144)
    - goBILDA Servo Power Module (3125-0001-0001)

3.2 Motors Allowed for Actuation

The following motors are approved for robot actuation:

- SparkFun Hobby Motor with Encoder (ROB-24053)
- SparkFun Hobby Motor with Encoder - Metal Gear (ROB-16413)
- Micro Gearmotor - 460 RPM (ROB-12429)
- Micro Gearmotor - 900 RPM (ROB-12316)
- Micro Gearmotor - 90 RPM (ROB-12285)
- Micro Gearmotor - 175 RPM (ROB-12205)
- N20 Motor With Encoder (ROB-28633)

3.3 Motor Controllers

- XRP Motor Controller Ports
- SparkFun Qwiic Motor Driver (ROB-15451)

4. Power Rules

4.1 Allowed Batteries

Robots may use **one (1)** set of the following batteries:

- Basic 4-cell NiMH AA Battery Pack (6V)
- goBILDA 6V Battery (3100-0006-0003)

4.2 Power Requirements

- Power supplied to the XRP controller must be **6V**
- Power supplied to motors may not exceed **6V**
- Batteries must be **securely mounted** and may not shift during match play
- Optional external power switch must be used between battery and robot power
- Power distribution devices/terminals are allowed and encouraged.
- Wire can not be bare, and all exposed wire should be properly covered by heat shrink terminal connectors, splices, and electrical tape

5. Safety and Mechanical Restrictions

5.1 General Safety

- Robots must not have burrs, sharp edges, or exposed fasteners that could cause injury
- All wiring must be:
    - Properly insulated
    - Secured
    - Free of exposed conductors
- All robot components must be securely mounted

5.2 Prohibited Mechanisms and Actions

- Robots may not damage, deform, or intentionally modify:
    - The field
    - Game elements
    - Field surfaces (including foam mats)
- Robots may not include mechanisms designed to **entangle, trap, snag, or damage**

other robots or game pieces
- Sharp spikes, hooks, or puncturing devices are not permitted

5.3 Restricted Systems

- Pneumatic systems are **not permitted**
- Hydraulic systems are **not permitted**
- Combustion engines, heating elements, and open flames are **not permitted**

6. Inspection and Modifications

- All robots must pass inspection before competing
- Inspectors have final authority on robot legality
- Robots may be repaired or modified between matches, provided they remain compliant with all construction rules

7. Software

7.1 XRP Code Editor

- Using the XRP code editor is the only allowed way to program the robot
    - https://xrpcode.wpi.edu/
- This streamlines the process for robot connection and gamepad use during matches.
- Custom libraries are allowed
- Use of Micro Python or Blocky is allowed
- Webserver is allowed for monitoring values during game play and may not be used to control robot actuation.
- Only Bluetooth connection is allowed to control a robot during matches. WIFI connection is allowed for Webserver.

7.2 Drive Station

- Any computer will work for the drive station, including chromebooks.
- Phones will not work for a drive station and will not be permitted.
- Wireless and wired gamepads are allowed
- Any gamepad may be used for controlling the robot, optionally a keyboard can be used if no gamepad is available.

8. Team Number/Alliance Display

8.1 Team Numbers

- Numbers must be clearly shown on two opposite sides of the robot.
- Numbers must be clear and easy to read, and at least 2 inches tall

8.1 Alliance Display

- Teams need to indicate what alliance they are on by marking blue or red on their robot.
- Colors must be shown at least on two opposite sides of the robot.
- Color marking should be at least 2.5 inches tall by 2.5 inches wide.

3D Printed Examples: