



The logo consists of the text "Powered By" above "FIREFLY IO". To the left of the text is a stylized icon of a firefly or bee, facing right. Below the main text is the tagline "Challenging The Status Quo".



ENGINEERS LEAGUE CHALLENGE

One Robot... Endless Possibilities





Smart City Builders Challenge

The Smart City Builders Challenge addresses the real-world needs of creating sustainable infrastructure, community services, and clean environments in growing African cities.

The Challenge

This year's GRC challenges participants to use 3D printed robot (Xplore Bot) design their own 3D attachment and program robots to address these critical issues through a simulated game.

Teams must complete three critical missions:

- Fixing a Broken Bridge (Road Infrastructure)
- Building Essential Services (School, Hospital, Workplace)
- Cleaning the City (Rubbish Collection)

The challenge promotes teamwork, problem-solving, and innovation while introducing students to Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities).

This challenge has two playing modes: Autonomous and Manual. At the start of each match, there is a 1 minutes mandatory autonomous mode in which each team's robot is required to complete any of the tasks without assistance or through control of any kind.

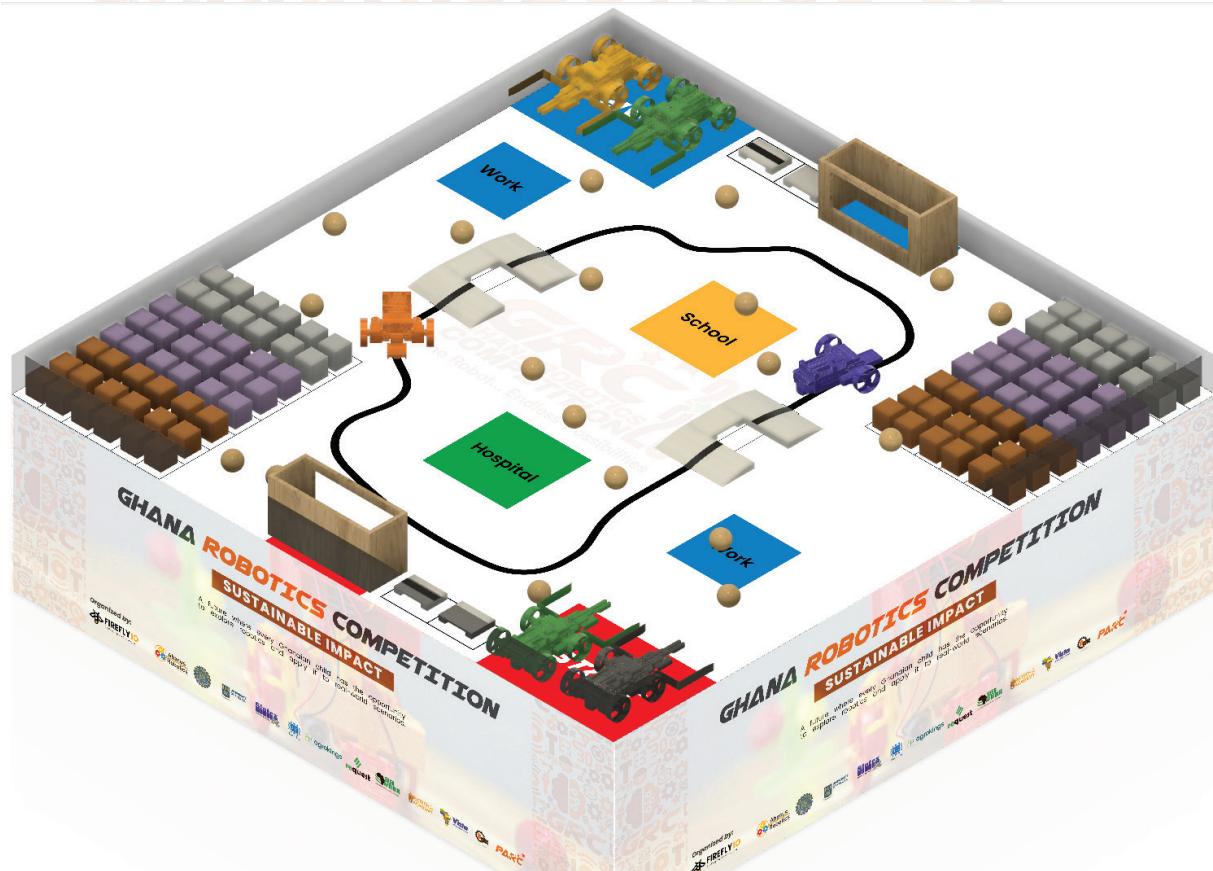
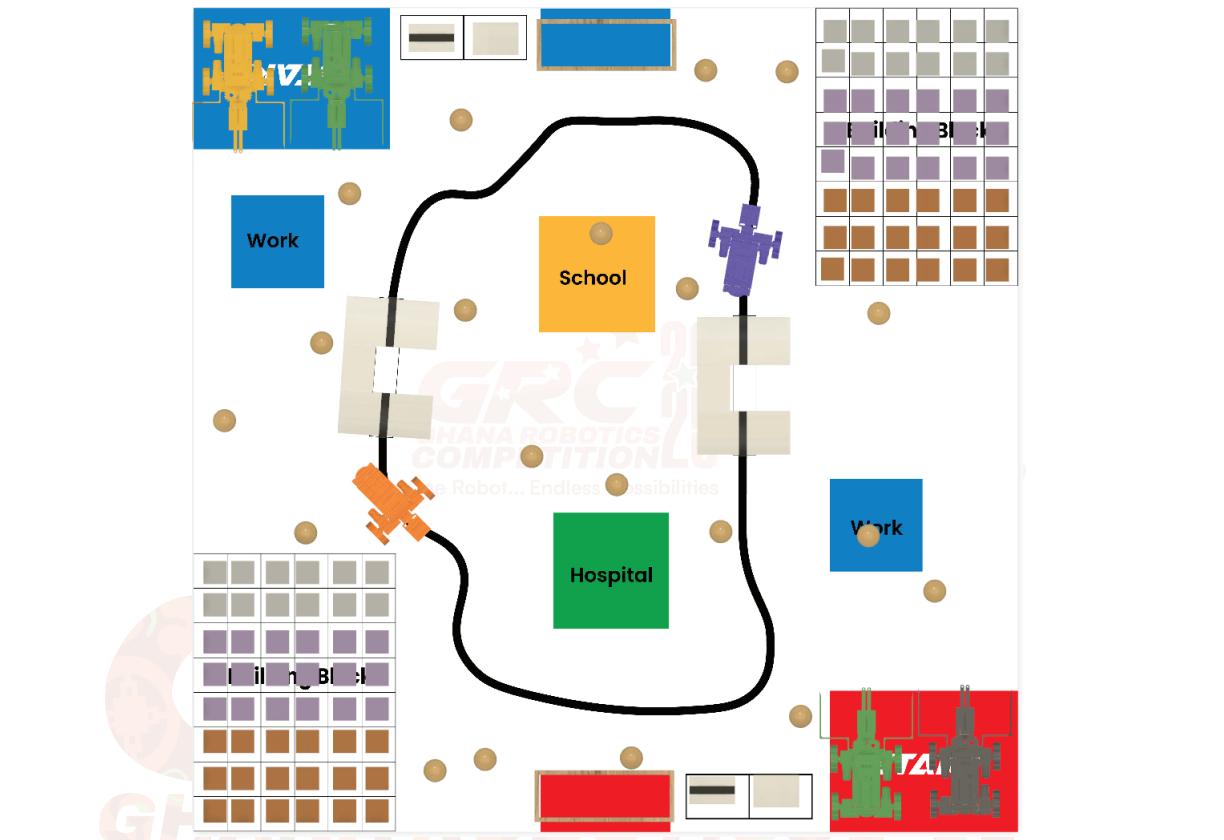
Points gained in the Autonomous mode gains you double the points as those gained in the manual mode. The match lasts for four (3) minutes. Each match is played by two alliances.

An alliance is made up of two teams. The alliance with the highest points at the end of each match wins.



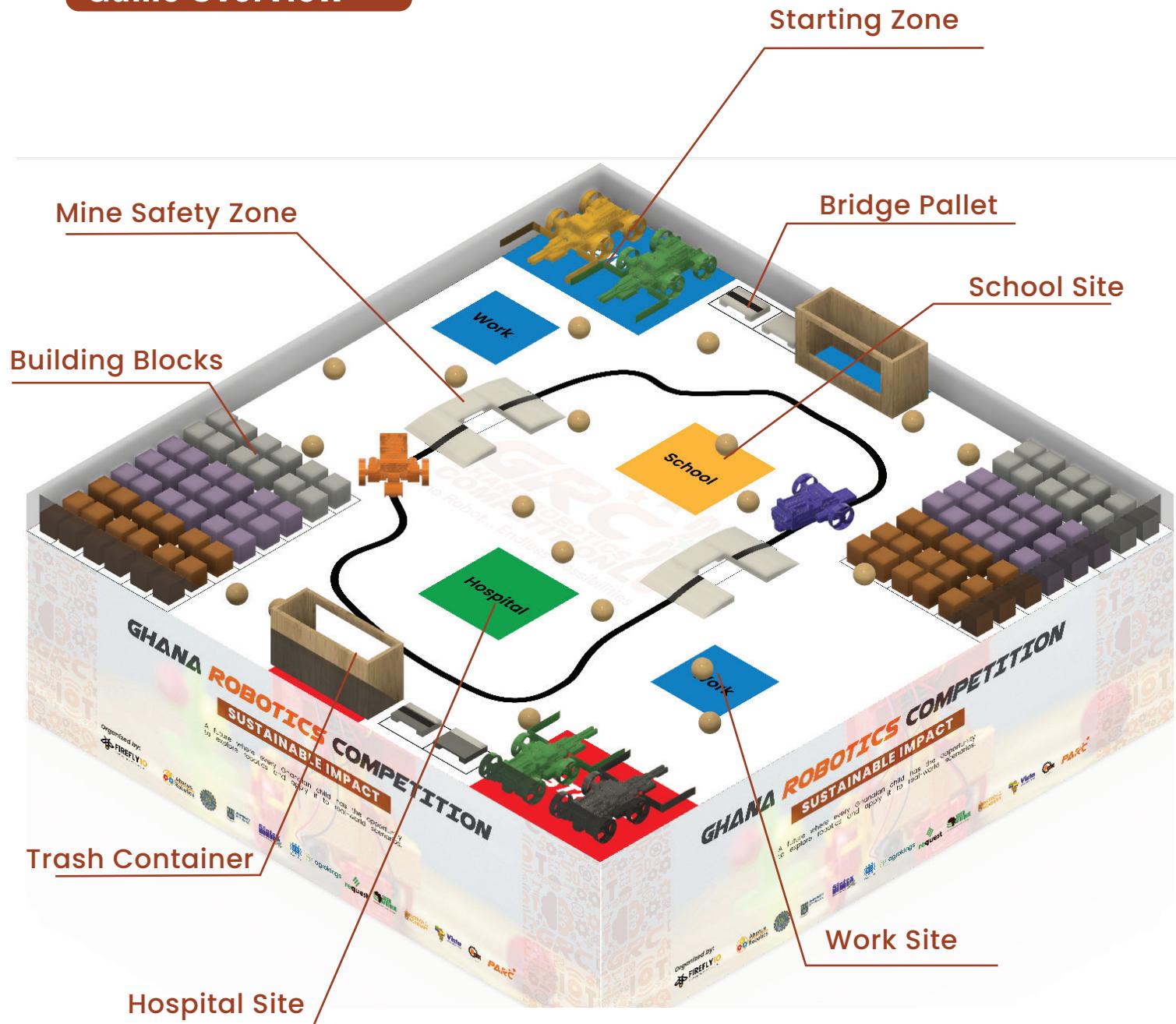


Game Overview





Game Overview





Road Infrastructure Mission

Bridges are vital for cities to stay connected. When a bridge collapses, it disrupts transportation, slows down emergency response, and impacts trade. In the Smart City Builders Challenge, teams must simulate the work of civil engineers — racing against time to fix a bridge before autonomous traffic arrives.

The Challenge

Teams must quickly use their robots to collect and deliver bridge pallets from the Home Zone to the broken section of the road (black line).

Meanwhile, two autonomous robots (or cars) are moving along the track toward the bridge. If the bridge is not fixed before the autonomous robots reach it, the robots will deviate off the track, and the team will incur a penalty.

If the team successfully fixes the bridge before the autonomous robots reach it, they will prevent deviation and earn bonus points for keeping the city safe and connected.

Task	Points
Each pallet placed correctly (Autonomous Mode)	40
Each pallet placed correctly (Manual Mode)	20
Car deviates from track due to broken bridge	-30
Bonus for fixing bridge before carrobots arrive	+10





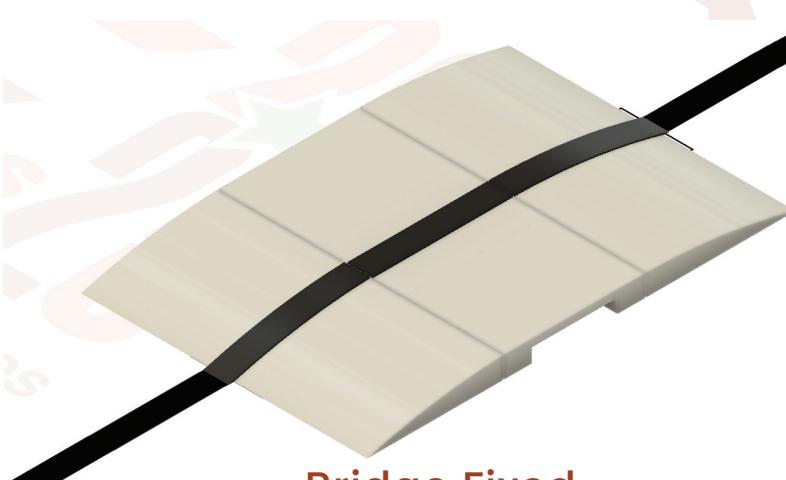
OBJ. 1 Overview and Game Elements



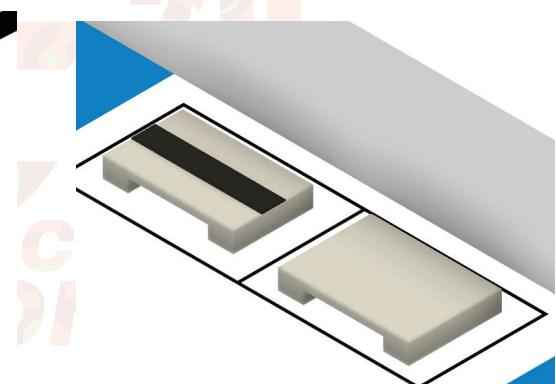
Broken Bridge



Broken Bridge

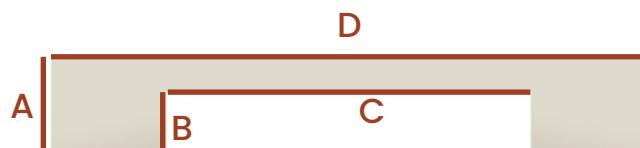


Bridge Fixed

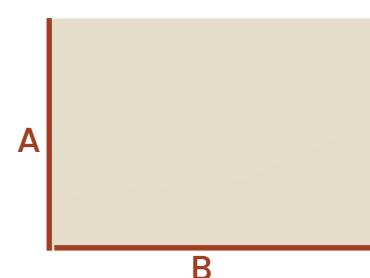


Bridge Pallets

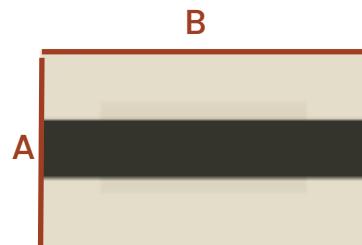
Pallets Dimension



A = 15mm
B = 10mm
C = 60mm
D = 100mm



A = 70mm
B = 100mm



A = 60mm
B = 100mm





Land Restoration Zone



A sustainable city needs hospitals, schools, and workplaces to serve its residents. Building these structures requires careful planning: laying strong foundations, constructing sturdy walls, and finishing with proper roofing.

In this mission, teams simulate urban construction projects, understanding that taller, stronger buildings create greater value for a city's future.

The Challenge

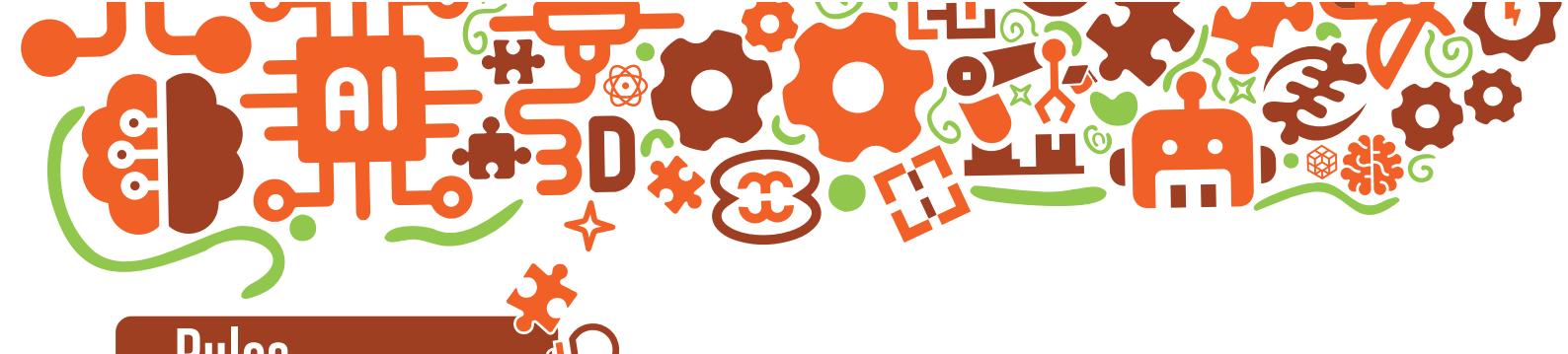


- The **Red Alliance** is responsible for building a *Hospital* and a *Workplace*.
- The **Blue Alliance** is responsible for building a *School* and a *Workplace*.

Teams must use their robots to collect building blocks from their home zones and assemble structures at the designated building sites. There are three types of building blocks, each with a specific role:

- **Foundation Blocks (Copper Color)** – The base layer for stability.
- **Middle Structure Blocks (Violet Color)** – The main body of the building.
- **Roof Blocks (Grey Color)** – The top layer, completing the building.





Rules

- Each building must have at least one foundation block (copper) at the base.
- A building must follow the correct order:
Copper >> Violet >> Grey.
- Blocks stacked outside the correct zone or in the wrong order will not score.
- The higher the building, the more points are earned:
The total score for a building is calculated by multiplying the base points by the number of blocks stacked.

Task	Points
Each correctly placed Foundation Block (Copper)	5
Each correctly placed Middle Block (Violet)	5
Each correctly placed Roof Block (Grey)	5
Multiplier for building height	TP x H
Misplaced block or wrong color order	-10
Complete structure built in correct zone	+50

Note:

TP = Total Point

H = Building Height

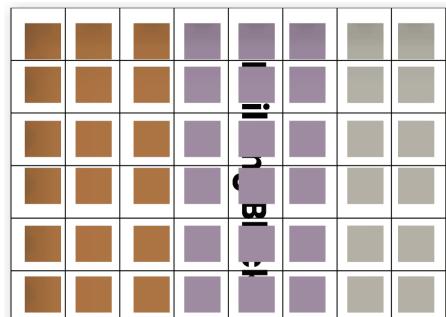




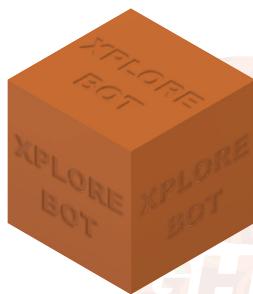
OBJ. 2 Overview and Game Elements



Building Blocks



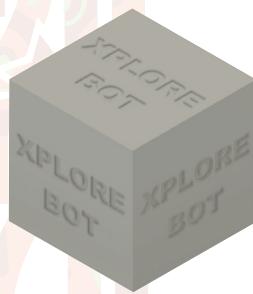
Building Blocks



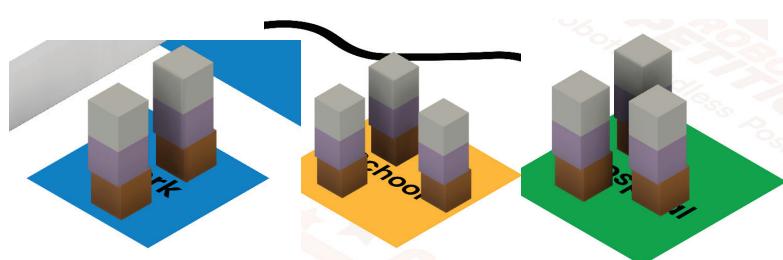
Foundation Blocks
50/50/50mm



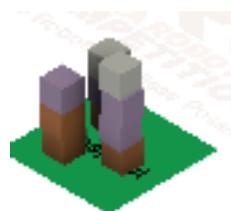
Middle Blocks
50/50/50mm



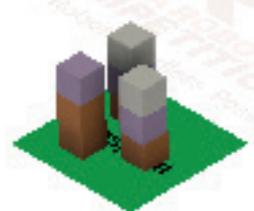
Roof Block
50/50/50mm



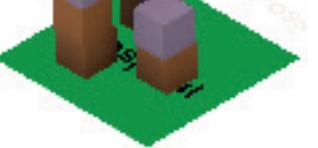
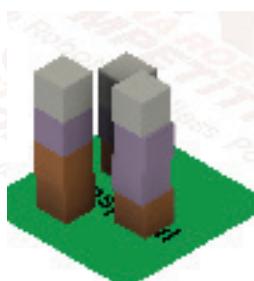
Complete Buildings



2 Completed
1 uncompleted



2 Completed
1 uncompleted



Uncompleted





Mine Safety Zone

Urban waste management is a major challenge for growing cities. Removing rubbish keeps cities clean, safe, and healthy.

The Challenge

Teams must use their robots to collect rubbish markers (wooden balls) scattered across the field and deposit them into the designated bins.

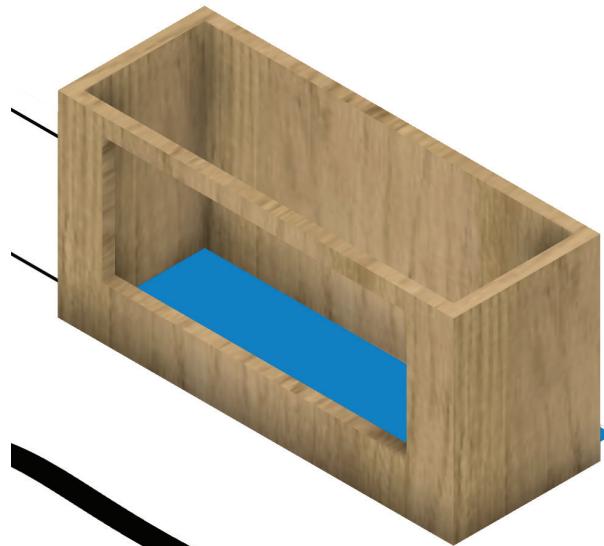
Rules

- Rubbish balls must be fully placed inside the bin to count.
- Robots may only carry one rubbish ball at a time.
- Dropped rubbish outside bins does not score.

Task	Points
Rubbish ball deposited (Autonomous)	10
Rubbish ball deposited (Manual)	5



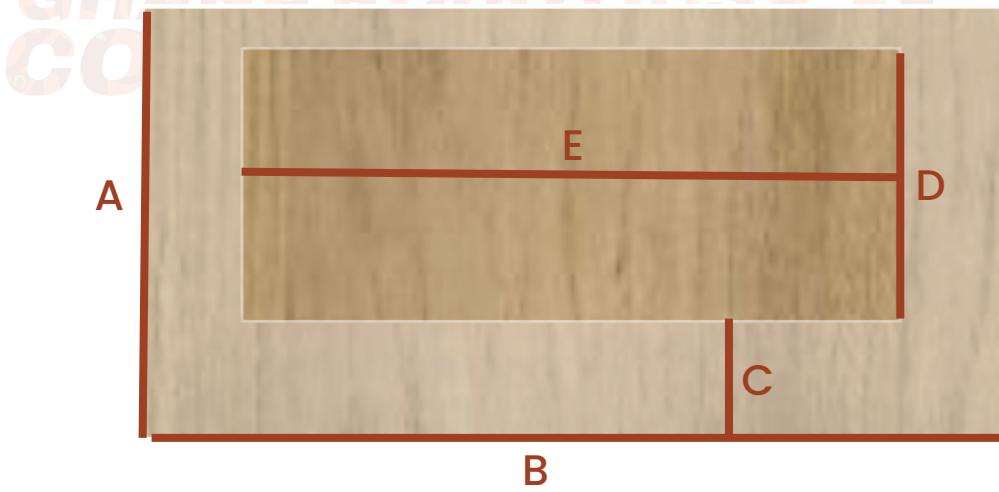
OBJ. 3 Overview and Game Elements



Trash Can



Trash



A = 150mm
B = 300mm
C = 35mm
D = 100mm
E = 230mm





Game Play & General Rules

Each match has two alliances playing at the same time.

After the start of the match, teams work to score as many points as possible by completing as many of the tasks as possible.

10-point penalty for touching your robot outside of the starting zone or manual zone, the penalty increases by 5 points for each additional touch. Contact between robots is allowed however intentionally damaging another robot is not allowed. This distinction is left to the referee. The penalty is a disqualification.

Robots must be constructed ONLY out of the kit materials provided.

The total length of the match is 3 minutes.

Robot must start the match from the Start Zone within the 30x30x30cm square and it can be no taller than 40 cm. However, the robot can extend outside of those limits after the start of the match. Once the match begins the robot cannot go back to the starting zone to start over.

Robots must be constructed with safety in mind; no sharp edges, no dangerous components, and nothing designed to intentionally damage other robots or field elements. If teams do not follow the rules, they are disqualified from the match.





Coaches / Adult General Rules

Important Behavior Guidelines for Team Adults / Coaches

To ensure a positive and educational experience for everyone, please adhere to the following behavior guidelines while interacting with your teams. When in doubt, remember: "Student Led, Student Success"

Focus on Learning Over Winning

Guideline: Emphasize the importance of learning and personal growth over the desire to win.

Reason: This helps students appreciate the other skills they learn through the competition.

Respect Student Centeredness

Guideline: Students must be the only ones designing, building, programming, and troubleshooting their robots.

Reason: This encourages critical thinking, problem-solving, and teamwork skills.

Provide Guidance, Not Answers

Guideline: Provide guidance through leading questions and guided discussions rather than providing direct answers or solutions.

Reason: This helps students develop independence and confidence in their abilities.





Coaches / Adult General Rules

Maintain a Positive Environment

Guideline: Create a supportive and encouraging atmosphere. Avoid negative comments or criticism.

Reason: A positive environment boosts student morale and encourages a growth mindset in which students are encouraged to overcome challenges.

Encourage Student Communication

Guideline: Students should be the only ones who communicate directly with judges, referees, and members of other teams.

Reason: Leading team communications gives students opportunities to practice their presentation, problem-solving, and negotiation skills.

Stay Behind the Scenes

Guideline: Adults should stay in the background during active problem-solving and match play.

Reason: When students are the primary participants and leaders in the competition, all teams are on a level playing field.

Respect All Participants

Guideline: Treat all students, mentors, volunteers, and other event attendees with respect and courtesy.

Reason: Respectful behavior promotes a fair and enjoyable experience for everyone involved.





Coaches / Adult General Rules

Maintain a Positive Environment

Guideline: Create a supportive and encouraging atmosphere. Avoid negative comments or criticism.

Reason: A positive environment boosts student morale and encourages a growth mindset in which students are encouraged to overcome challenges.

Encourage Student Communication

Guideline: Students should be the only ones who communicate directly with judges, referees, and members of other teams.

Reason: Leading team communications gives students opportunities to practice their presentation, problem-solving, and negotiation skills.

Stay Behind the Scenes

Guideline: Adults should stay in the background during active problem-solving and match play.

Reason: When students are the primary participants and leaders in the competition, all teams are on a level playing field.

Respect All Participants

Guideline: Treat all students, mentors, volunteers, and other event attendees with respect and courtesy.

Reason: Respectful behavior promotes a fair and enjoyable experience for everyone involved.





General Definitions

Adult - Anyone who is not a Student.

Alliance - A pre-assigned grouping of two (2) Teams that are paired together during a given Match.

Alliance Station - The designated regions where the Drive Team Members must remain for the duration of the Match.

Autonomous Bonus - A point bonus awarded to the Alliance that has earned the most points at the end of the Autonomous Period.

Disablement - A penalty applied to a Team for a rule Violation. A Team that is Disabled is not allowed to operate their Robot for the remainder of the Match, and the Drive Team Member(s) will be asked to place their controller(s) on the ground.

Disqualification - A penalty applied to a Team for a rule Violation. A Team that receives a Disqualification in a Qualification Match receives zero (0) Win Points,

Drive Team Member - A Student who stands in the Alliance Station during a Match. Adults are not allowed to be Drive Team Members.

Entanglement - A Robot status. A Robot is Entangled if it has grabbed, hooked, or attached to an opposing Robot or a Field Element.





General Definitions

Game Design Committee (GDC) – The creators of GRC, and authors of this match Manual.

Match – A set period, consisting of Autonomous and/or Driver Controlled Periods, during which Teams play a defined version of Spin Up to earn points.

Autonomous Period – A period during which Robots operate and react only to sensor inputs and commands pre-programmed by the Students into the Robot control system.

Driver Controlled Period – A period during which Drive Team Members operate their Robot via remote control.

Robot – A machine that has passed inspection, designed to execute one or more tasks autonomously and / or by remote control from a Drive Team Member.

Student – A person is considered a Student if they meet both of the following criteria:

Anyone who is earning or has earned credit toward a high school diploma, certificate, or other equivalent during the six (6) months preceding the GRC 2025. Courses earning credits leading up to high school would satisfy this requirement.

Anyone born after May 1, 2000 (i.e., who will be 25 or younger at GRC 2025).

Eligibility may also be granted based on a disability that has delayed education by at least one year.





General Definitions

Team – One or more Students make up a Team.

A Team is classified as a Middle School Team if all members are Middle School Students or between the age of 8 to 15 years.

A Team is classified as a High School Team if any of its members are High School Students, or if the Team is made up of Middle School Students who declare themselves “playing up” as High School Students by registering their Team as a High School Team or between the age of 14 to 19 years.

Team Captain – A Student who have significant responsibility for strategy and teamwork while the game is in progress on the field.

In the context of this Game Manual, Teams include three Student roles related to Team captain, Robot assembly, and programming. Adults may not fulfil any of these roles.

Builder – The Student(s) on the Team who assemble(s) the Robot. Adults are permitted to teach the Builder(s) how to use concepts or tools associated with Robot construction, but may never work on the Robot without the Builder(s) present and actively participating.

Designer – The Student(s) on the Team who design(s) the Robot. Adults are permitted to teach the Designer(s) how to use concepts or tools associated with design, but may never work on the design of the Robot without the Designer(s) present and actively participating.





General Definitions

Programmer – The Student(s) on the Team who write(s) the computer code that is downloaded onto the Robot. Adults are permitted to teach the Programmer(s) how to use concepts or tools associated with programming, but may never work on the code that goes on the Robot without the Programmer(s) present and actively participating.

Trapping – A Robot status. A Robot is Trapping if it has restricted an opposing Robot into a small, confined area of the field, approximately the size of one foam field tile or less, and has not provided an avenue for escape. Trapping can be direct (e.g: pinning an opponent to a field perimeter wall) or indirect (e.g: preventing a Robot from escaping from a corner of the field).

Note: If a Robot is not attempting to escape, then that Robot has not been Trapped.

Violation – The act of breaking a rule in the match Manual.

Minor Violation – A Violation which does not result in a Disqualification.

Accidental, momentary, or otherwise non-Match Affecting Violations are usually Minor Violations.

Minor Violations usually result in a verbal warning from the Head Referee during the Match, which should serve to inform the Team that a rule is being Violated before it escalates to a Major Violation.



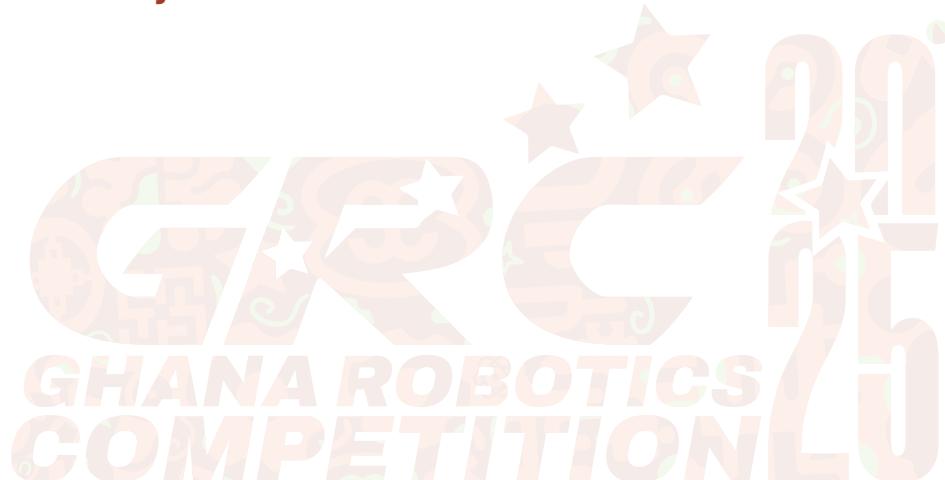


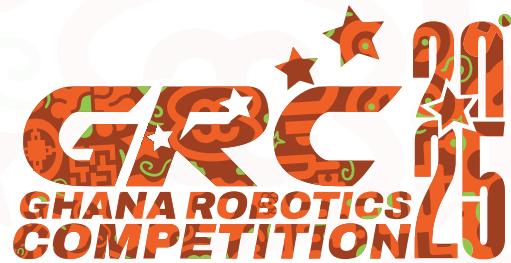
General Definitions

Major Violation - A Violation which results in a Disqualification. Unless otherwise noted in a rule, all Match Affecting Violations are Major Violations.

If noted in the rule, egregious or intentional Violations may also be Major Violations.

Multiple Minor Violations within a Match or tournament may escalate to a Major Violation, at the Head Referee's discretion.





THANK

You

**Technical
Partner:**

Grayspace Digital
+233 59 417 1887

Have any questions?
please reach out to us at:

grc@fireflyio.com
+233 54 452 5401
+233 54 906 2400
+233 55 342 4972

Contact

George Sarfo
Founder and CEO

P : +233 54 452 5401
E : info@fireflyio.com
w : www.fireflyio.com
L : Haatso, Madina

