



VALOR CAD CHALLENGE

STACK UP

SUMMER
2025

HOSTED BY

FRC TEAM VALOR 6800

PRESENTED BY

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SPECIAL THANKS TO

FUN Robotics Network for hosting the awards ceremony.

Studica Robotics for sponsoring \$100 in prizes.



Game Resources

Stack Up Full Field Cad: [2025 Stack Up Field](#)

Stack Up Game Manual: [2025 Stack Up Game Manual](#)

Stack Up Scoring Rubric: [2025 Stack Up Scoring Rubric](#)

Simplified FTC Field Model: [Simplified FTC Field](#)

Simplified FTC Perimeter: [Simplified FTC Perimeter](#)

Simplified FTC Tiles: [Simplified FTC Fields](#)

1.0: Introduction

The following manual describes the rules and information needed to play the Summer 2025 Valor CAD Challenge game: Stack Up. Stack Up is played on a 12' x 12' foam tile field with 1' high walls. Two alliances will compete head-to-head, with alliances composed of two robots. Teams will compete through the qualifications, attempting to obtain Ranking Points(RP) to determine their seating. RP is obtained through various methods, and teams can obtain up to 6 RP per match. Teams will attempt to gain points by traversing the scaffold, scoring in the high or low goals of the stack board, getting 4-in-a-rows, resetting the board, and climbing onto the scaffold for endgame. The alliance that has the most points at the end of the match wins the game.

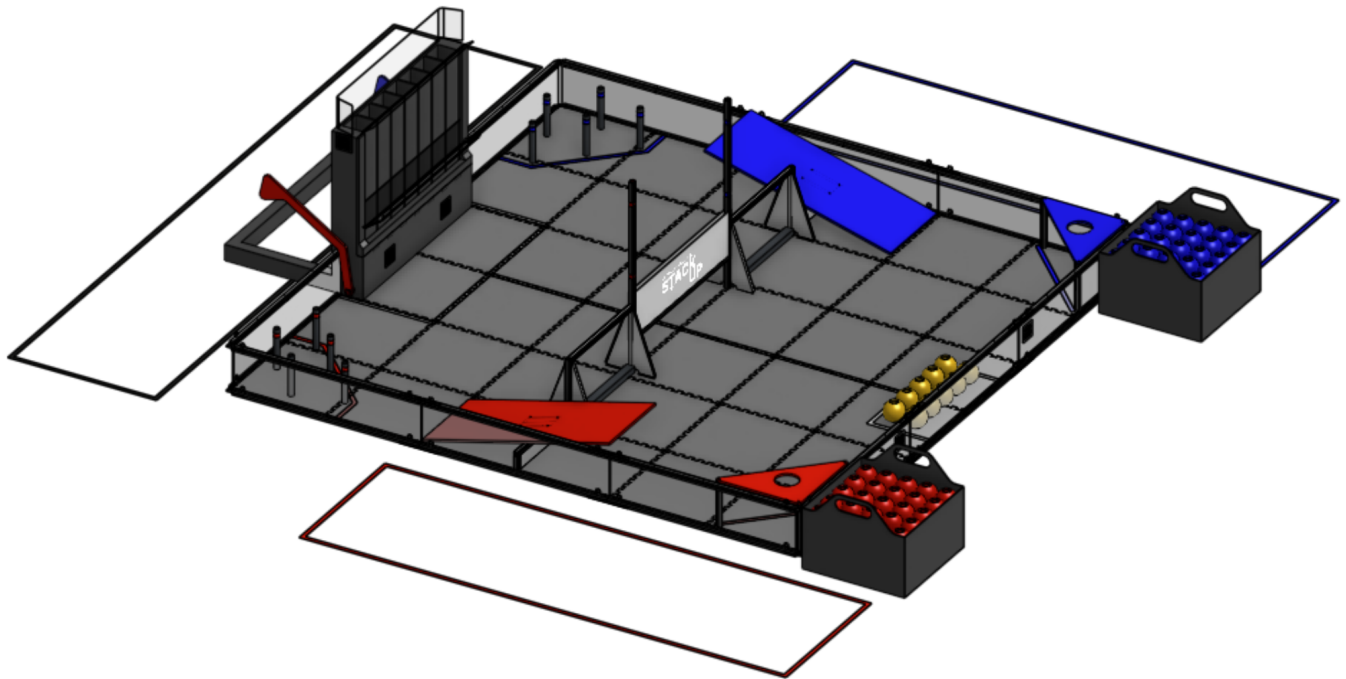
This is a CAD challenge for a theoretical game; teams will submit a robot CAD model and an engineering portfolio. The robots will never be built; this is just an opportunity for people to practice their CAD skills and win prizes!



TABLE OF CONTENTS

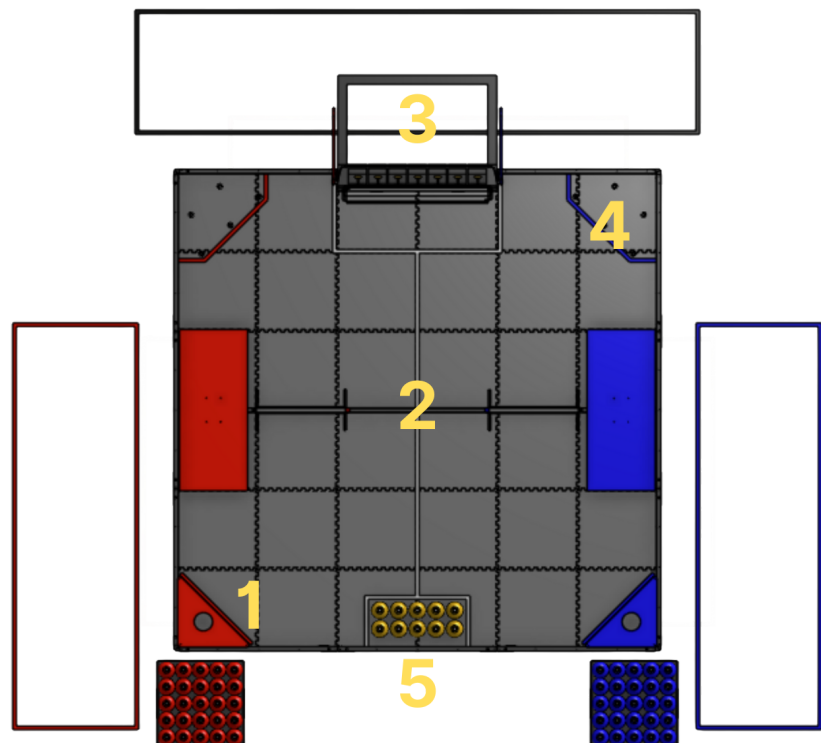
Timeline and Deliverables.....	2
1.0: Introduction.....	2
2.0: The Field.....	4
2.1: Field Layout.....	4
2.2: Loading Bay.....	5
2.3: Stack Zone.....	5
2.4: Scaffold.....	6
2.5: Stack Board.....	7
2.6: Stack Pole.....	8
3.0: The Game.....	9
3.1: MATCH PLAY.....	9
3.2: FOULS AND PENALTIES.....	9
3.3: Scoring and Ranking Points.....	10
3.4: SAFETY RULES.....	11
3.5: GENERAL RULES.....	11
3.6: ROBOT RULES.....	12
3.7: ROBOT TO ROBOT INTERACTION.....	13
4.0: ROBOT.....	13
5.0: CAD CHALLENGE RULES.....	14

2.0: The Field



2.1: Field Layout

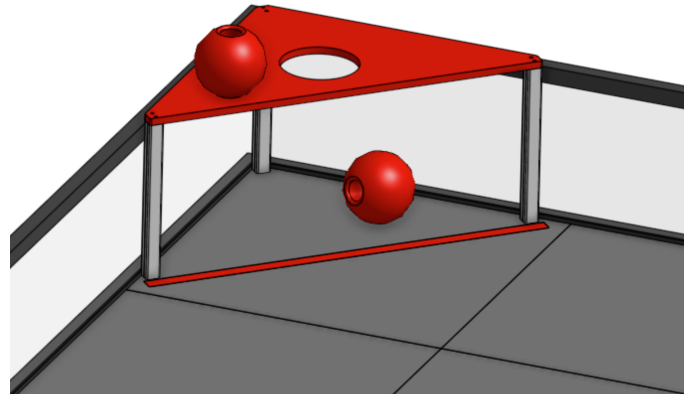
1. Loading Bay
2. Scaffold
3. Stack Board
4. Stack Poles
5. Nodes



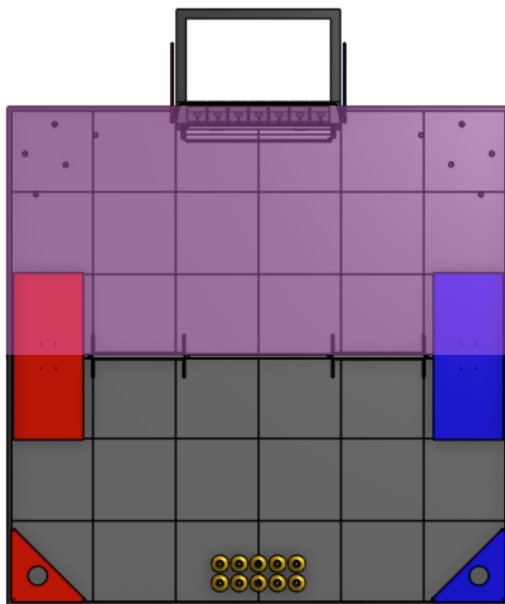
2.2: Loading Bay

The Loading Bay is the only place robots can receive game pieces during the match. The Loading Bay is alliance-specific, and a robot may not pass the vertical plane made by the tape for the other team's Loading Bay. If a robot reaches into the opposing alliance's Loading Bay, then a yellow card will be given.

The human player may only set the Node on the top of the Loading Bay or they may drop it into the hole (allowing it to fall to the lower level). Any attempt to roll the Node will result in a minor penalty at a judge's discretion.



2.3: Stack Zone

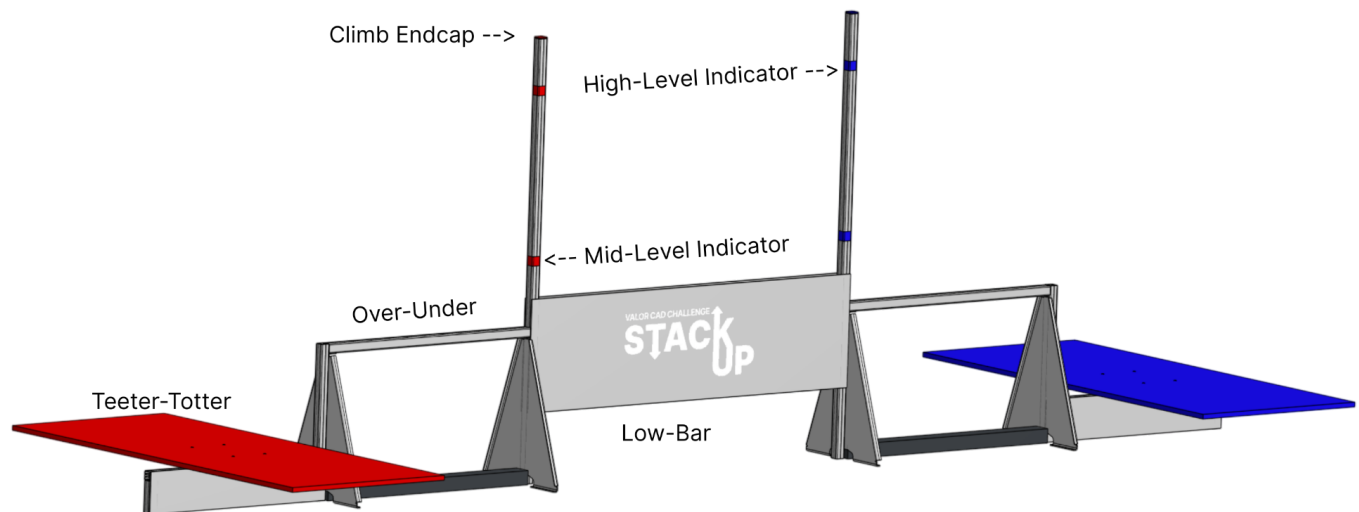


The Stack Zone is defined by the zone highlighted in purple above. **The Stack Zone, although not an obstacle, defines what you can and can not do in the game. For a robot to be in the Stack Zone, it must be entirely enclosed in its region (the upper half of the field) and not in contact with any of the Scaffolds (this includes the Teeter-Totter).**

Once a robot is in the Stack Zone, it may score on the Stack Poles or in the Stack Board. If a robot scores while not being in the Stack Zone, their alliance will receive a Minor Penalty.

The Stack Zone also restricts where a robot may start. A robot's starting point may not be partially enclosed within the Stack Zone, or touching the Teeter-Totter. Failing to start fully outside of the Stack Zone will disqualify a robot from a match.

2.4: Scaffold

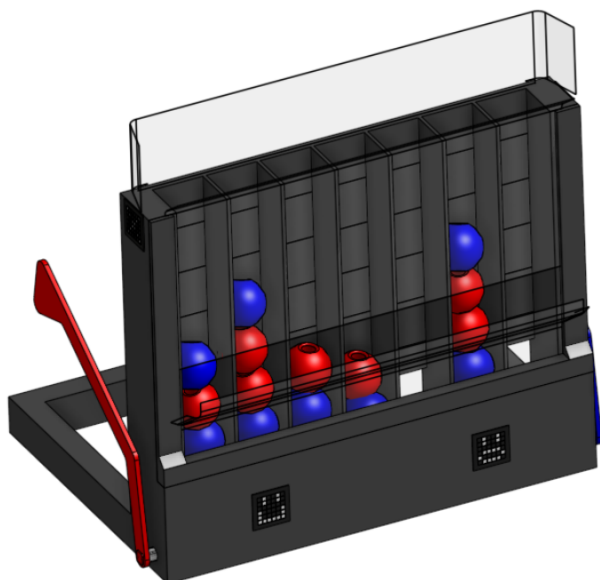


The Scaffold is comprised of the Teeter-Totter, the Over-Under, and the Low-Bar, stacked up to provide a terrain challenge for teams to traverse across. In the autonomous period, teams will obtain 3 points for fully traversing the Scaffold to the Stack Zone, receiving the points a maximum of one time per robot. **During the end game, teams may climb on the Scaffold to achieve either a low, mid, or high climb, with each climb achieving your alliance 4, 12, and 20 Stack points respectively. Teams will receive varying amounts of Stack Points depending on what tier they achieved.**

- Robots may earn Stack Points for the Low Climb if:
 - Your alliance's Teeter-Totter is level **AND**
 - Your robot is fully supported by the top of your alliance's Teeter-Totter.
- Robots may earn Stack Points for the Mid Climb if:
 - Your robot is fully above the mid-level indicator in the Z-plane **AND**
 - Your robot is on your half of the field
- Robots may earn Stack Points for the High Climb if:
 - Your robot is fully above the high-level indicator in the Z-plane.

Stack Points are rewarded 5 seconds after the end of the match; this means, you must be able to have the Teeter-Totter balanced and your robot fully supported by the top of it or your robot fully above the mid/high-level indicators 5 seconds after the end of the match. A robot will receive the highest level of climb they qualify for. **If both robots in an alliance receive the same level of climb, they will both receive the points. If your alliance receives 24 Stack Points, you will gain the Stack RP.**

2.5: Stack Board

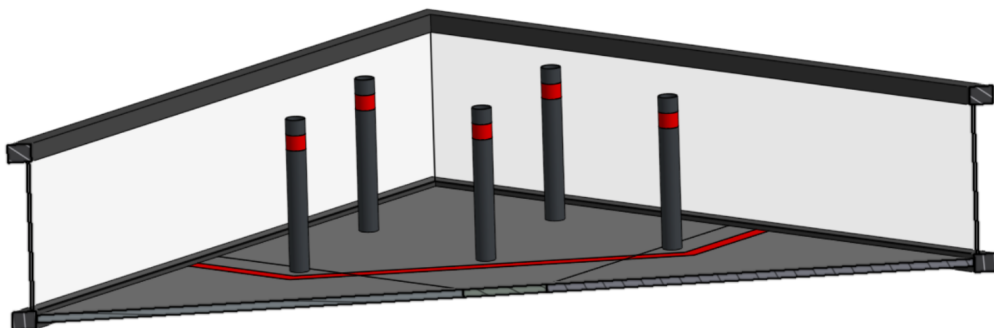


The Stack Board is where you score your alliance-specific Node to receive points. The Stack board is composed of 6 rows and 7 columns. Node can be scored on a low or high goal. If a column already holds 2 Nodes, the bottom row becomes full, and no more Nodes can be scored in that column using the low goal. **For the sake of the CAD challenge, assume shooting the nodes will not be accurate enough to reliably score in a desired column. In the Stack Board, you can gain points through the High Goal, Low Goal, 4-in-a-row, and Stack Clears.**

- **High Goal:**
 - If an alliance-specific Node is scored into the high goal and fully seats into a column, then the same color alliance will receive 6 points in the autonomous period and 4 points for the rest of the match. The points gained from scoring will be instantly added to your point total and can not be removed.
- **Low Goal:**
 - If an alliance-specific Node is scored into the low goal and fully seats into a column, then the same color alliance will receive 3 points in the autonomous period and 2 points for the rest of the match. The points gained from scoring will be instantly added to your point total and can not be removed.
- **4-in-a-row:**
 - Any game piece will only be able to count for a single 4-in-a-row. The alliance will receive 12 points per 4-in-a-row in the autonomous period and 8 points per 4-in-a-row past the autonomous period of the game.
 - The judges will do their best to optimize the number of 4-in-a-row made on the board. If a 4-in-a-row is already counted for points, then it will not be recounted or able to be "optimized."
 - A 4-in-a-row will be counted at the end of auto, on a stack reset, and 5 seconds after the match.
- **Stack Clears:**
 - When a stack reset is successfully activated, the alliance will receive 3 points for every 4-in-a-row cleared.

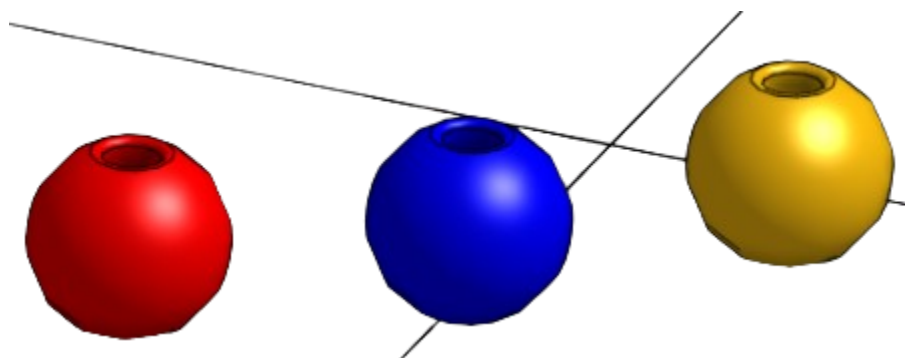
If an alliance activates a stack clear, their human player will be required to fully reset the board within 5 seconds. The human player can reset the board by pushing and holding the lever. If the Human player fails to reset the board within this time, or holds the lever after 5 seconds, the alliance that initiated the stack reset will receive a Minor Penalty.

2.6: Stack Pole



The stack poles are a series of 5 alliance-specific poles which the neutral colored nodes are scored onto. Once two nodes are scored on a single Stack Pole, a stack clear is triggered, and the human player of the alliance who triggered the stack clear will have 5 seconds to pull the lever on the Stack Board to reset the board, removing all nodes from it and granting 3 points per 4-in-a-row cleared. Scoring a colored node on a Stack Pole will not count towards a stack clear. Scoring a node on an opponent's stack pole will result in a Major Penalty.

2.7: Nodes



Nodes consist of 3 types: alliance-specific red nodes, alliance-specific blue nodes, and neutral yellow nodes. Throughout the game, robots may be in control of up to 1 node at a time, and robots may not control nodes of the opposing alliance. Robots have the option to preload 1 alliance-specific node at the beginning of the match. If a team chooses to start with a preload, they must be in contact with the Node at the start of the match. Additional alliance-specific nodes can be introduced at the respective alliance loading bay after the start of the match. Alliance-specific nodes can then be placed on the Stack Board to score points. Yellow nodes are found in a taped-off section of the field, and they can then be placed on stack poles in order to trigger a stack clear as specified in section 2.6.



3.0: THE GAME

3.1: MATCH PLAY

Match Length - Each Match is 2 minutes and 30 seconds long. Before each match, Human players will receive enough alliance-specific Nodes to last the length of the match; 10 neutral Nodes will be inserted onto the field in their designated zone.

Autonomous - Autonomous will take place in the first 30 seconds of the match. <G10> clarifies where robots can start in the match.

End Game - The end game will occur in the last 30 seconds of the match.

3.2: FOULS AND PENALTIES

Action	Consequence
Minor Penalty	3 Points awarded to the opposing alliance
Major Penalty	6 Points awarded to the opposing alliance
Yellow Card	Double Major Penalty (12 Points awarded to the opposing alliance)
Red Card	All points scored in the match by the team in question are nullified



3.3: Scoring and Ranking Points

Action	Auto Points	Teleop Points	Endgame Points
Cross the Field to the Scoring Side During Auto	3 pts		
Score a Node in the low level of the Stack Up Board	3 pts	2 pts	2 pts
Score a Node in the high level of the Stack Up Board	6 pts	4 pts	4 pt
Achieve 4 game pieces in a row	12 pts	8 pts	8 pts
Score a Yellow Node onto a Pole	1 pt	1 pt	1 pts
Points per 4-in-a-row removed during a reset.		3pts	3pts
Reach the Low Level Climb Height in the Endgame			4 pts
Reach the Mid Level Climb Height in the Endgame			12 pts
Reach the High Level Climb Height in the Endgame			20 pts
Victory RP	The alliance that gains the most points receives 3 Ranking Points for the victory. In the event of a tie, each alliance is awarded 1 RP.		
Reset RP	If an alliance is able to trigger two resets throughout the course of a match, they achieve the Reset RP		
Stack RP	If an alliance is able to score at least 16 Nodes throughout the course of a match, they achieve the Stack RP		
Endgame RP	If an alliance is able to achieve 24 or more Stack Points, they achieve the Endgame RP		



3.4: SAFETY RULES

<S1> At any point, no robot can extend over the field wall, this will result in a yellow card.

<S2> No robot can compete if it poses a risk to other robots, failure to comply with this rule will result in a red card and possible disqualification.

<S4> A robot may not attempt to interact with the STACK BOARD RESET LEVER in any manner. A robot preventing a Stack Reset from occurring will result in a yellow card. A robot initiating a Stack Reset will receive a red card.

<S5> A robot may not intentionally attempt to launch another robot using the Teeter-Totter in any fashion. Attempting to launch another robot will result in a red card and possible disqualification.

<S6> A robot may not trap a robot, in any fashion, using the Teeter-Totter. Any attempt to trap another robot using the Teeter-Totter will result in a red card and possible disqualification.

<S7> A robot may not intentionally damage the field in any way. Any attempt to do so will result in a red card and possible disqualification.

<S8> A robot may not be in contact with any game objects a human is actively in contact with.

<S9> The human player may not reach beyond the top plate of the loading bay.

3.5: GENERAL RULES

<G1> All robots must pass inspection. The robot must be the last and only thing that the teams place and leave on the field before the match begins.

<G2> Strategies that force the other alliance to commit penalties are not in the spirit of Gracious Professionalism, and failure to comply with this rule will result in a red card.

<G3> For Stack Up, robots may only control one Node at a time. A robot has 3 seconds after controlling multiple Nodes to remove them such that they are no longer in possession of extra Nodes before a minor penalty is issued. Any excess Nodes a robot controls cannot be scored.

<G4> A robot may not attempt to lose possession of an alliance-specific Node intentionally without the intent of scoring it. Any attempt to do so will result in a minor foul.

<G5> A robot may not attempt to lose possession of a neutral Node intentionally without the intent of scoring it or dropping it in place. Any attempt to do so will result in a minor foul.

<G6> If a robot violates rule <G3>, it may not be penalized for rule <G5> at a judge's discretion.

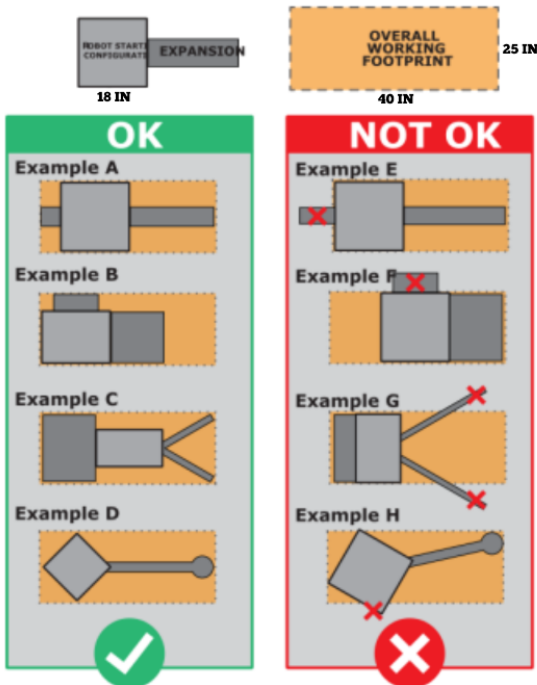
<G7> No robot can compete if it has components designed to prevent Nodes from entering into the Stack Board.

<G8> A team is not allowed to score a node onto the opposing alliances stack poles. Penalty: Major Foul.

3.6: ROBOT RULES

<G9> Mechanisms that are designed to grab, grasp, or attach to another robot of the opposing alliance are illegal and will be required to be disassembled before the match.

Figure 12-1: Expansion Limits



<G10> Refer to Figure 12-1. Once the match begins, a robot's bounding box may not exceed 25" x 40". The bottom robot is illegal, as its total extended wingspan measures greater than 40", as measured from the ends of the frame perimeter. The bounding box is dynamic so it is not fixed to your drivetrain, your robot should be able to have a 25" x 40" box put over it in all states of the robot. Software control to limit this size is allowed.

<G11> Robots that intentionally detach or leave parts on the field are illegal. Failure to comply will result in a major penalty for every second the mechanism is on the field, or result in a disqualification if deemed egregious behavior by the judges.

<G12> After the match begins, Robots are allowed to extend to any length vertically.

<G13> Scoring an opponent-colored Node into Stack Board will be counted as the opponent scoring that game piece.

<G14> Robots must start touching the field perimeter, on their side of the field, completely outside of the Stack Zone, the Neutral Node Zone, and not touching the Scaffolding or Teeter-Totter. Failure to do so will prevent the match from starting.

<G15> Robots may not touch the climb endcap at any point during the game. If a robot does so, any Stack Points that robot qualifies for will be voided.

<G16> Robots will receive a minor penalty if they attempt to climb the Stack Board or the Stack Poles.

<G17> Robots attempting to score into the Stack Board or onto the Stack Poles while not being fully in the Stack Zone will receive a minor penalty.



3.7: ROBOT TO ROBOT INTERACTION

<G18> A robot that tampers with an opponent attempting to climb will receive a major foul. A robot can be considered as attempting to climb from two definitions: A robot in contact with its alliance-specific Teeter-Totter during the endgame period of the match is considered to be attempting to climb. If, during the endgame, a robot is in contact with any point on the scaffold higher than 22" off the ground and is fully on its half of the field. Tampering with a climb also counts as touching the opponent's Teeter-Totter during the endgame.

<G19> Robots cannot pin an opponent's robot for more than 3 seconds. A robot will be considered pinned until the robots have separated by at least a foot. Then, the pinning robot must wait 5 seconds before attempting to pin again. If a robot is accidentally pinned by another robot due to moving around on the field, the referee will act as a traffic coordinator to separate the opposing robots. Violation: Major Penalty

<G20> Strategies aimed at flipping or destroying robots through damage or entanglement are not allowed and are especially not in the spirit of Coopertition and Gracious Professionalism. Failure to comply: Red Card

<G21> A robot cannot intentionally attempt to stop the flow of play. A single robot blocking access to an area for a short period of time is not considered to impede the flow of the match. Failure to comply: Red Card

<G22> When in front of the Stack Board, inside of the taped region, robots ARE allowed to push robots aside in an attempt to score with chassis-on-chassis contact ONLY. Aggressive behavior and strategies will be at the discretion of the judges. Pinning is not pushing, and pinning is not allowed when a robot breaks the vertical plane of the taped region in front of the Stack Board. You are not allowed to defend against a robot; you are only allowed to shove them aside in an attempt to score in a specific column on the Stack Board.

<G23> A robot may not grab onto any portion of the Stack Board; leaning against it or pushing into the front of it is allowed. Any attempt to grab the stack board will result in a minor penalty. Any robot fully supported by the stack board will receive a major penalty.



4.0: ROBOT RULES

<R1> Teams must submit their robots for inspection. The robot must be an electromechanical assembly designed by teams of up to three competing in the VCC to perform tasks in the challenge. Robots must contain all necessary electrical components to compete in a match, and implementation must follow a design approach purposely designed for the challenge.

<R2> All robots will be inspected and judged by a member of the Judging team, using the same inspection sheet used at FTC qualifier events. If a team has broken a rule, the final score will be deducted by 3 points per broken rule. For rule clarification, a channel in the discord server will be created for team members to ask the GDC. These clarifications will happen during the course of the CAD challenge.

<R3> The robot must fit in an 18" x 18" x 18" sizing cube, but can extend to any size at the beginning of the match unless stated otherwise by different rules. The robot must be built out of COTS materials and any allowed materials specified in "Into The Deep" Manuals 1 and 2. If you are unsure if your component is legal, feel free to ask for a rule clarification or look in these respective manuals.

<R4> A weight limit will be omitted for the challenge. However, not only would it be unwise to design a robot that is excessively heavy, it may be considered damaging the field if you attempt to climb in a concerning manner while weighing an excessive amount.

<R5> Mechanical or electrical components created before the build season of the challenge are only permitted if the source files are from COTS part providers. If the component was designed by you, the part needs to be publicly available beforehand. Evidence will need to be provided.

<R6> Suction methods will be allowed; however, are not required for robots to use. This rule is explicitly stated as typical FTC challenges do not legalize suction methods. Suction cannot be done via pneumatic or electric systems.

<R7> Egregious methods to traverse the Scaffold may be considered damaging to the field and are not allowed. If you are unsure if your design is considered damaging to the field, feel free to ask for a rule clarification or look in these respective manuals.



5.0: CAD CHALLENGE RULES

<VCC1> Teams must consist of 1-3 people, with larger teams allowed at the discretion of the judging team and GDC. We also ask that mentors who are competing in the challenge compete alongside the team that they are mentoring. However, everyone is allowed to compete in their desired teams.

<VCC2> Teams will be required to submit at least 4 renders of their robot along with at least a page-long **Engineering Portfolio**. The **Engineering Portfolio** is a document consisting of a general explanation of the robot and its many functions, along with information regarding the team's design process. DO NOT neglect this, as it will be used to determine a tiebreaker and will be critical for the judges in awarding points.

<VCC3> Communication between teams is allowed, but sharing parts or ideas is against the rules. Violation: Disqualification of both teams from the challenge.

<VCC4> If there's a hole in the ruleset please let us know. You aren't clever if you exploit the system. The entire purpose of the challenge is to create a learning experience where teams can design robots for fun, to learn, and to have fun in a low-stakes competition, so please remember your gracious professionalism and Coopertition.

<VCC5> Breaking design rules will result in a 3-point deduction from the final team score. Egregious rule-breaking with no intent to participate will result in disqualification from the CAD Challenge.

<VCC6> Meme robots will not be tolerated; they will be ignored and may result in a team not being invited back to the competition. If you are unsure about what defines a meme robot, feel free to ask for clarification from the judges.

<VCC7> Have fun and remember your gracious professionalism!

6.0: FAQ

- You are allowed to shoot the game elements if you meet the scoring criteria.
- You may not choose to publish private designs to use them now that the game has started.
- Buddy climbs(one robot holds another robot) are allowed, but keep in mind any part dangling below the level indicators will disqualify a robot from achieving that level of climb. Robots are counted separately even if they are buddy climbing.