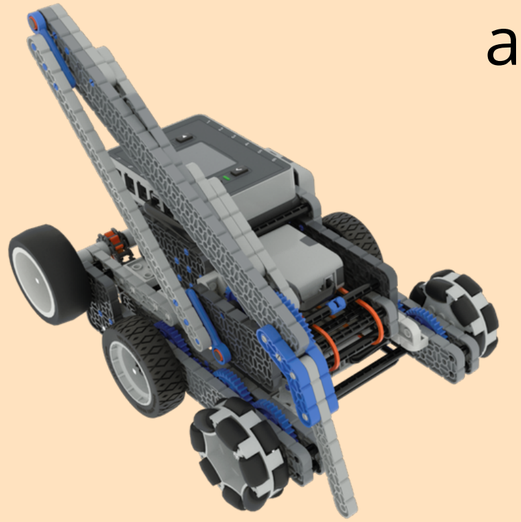
Sandpiper Training Session
Building Drive bases!

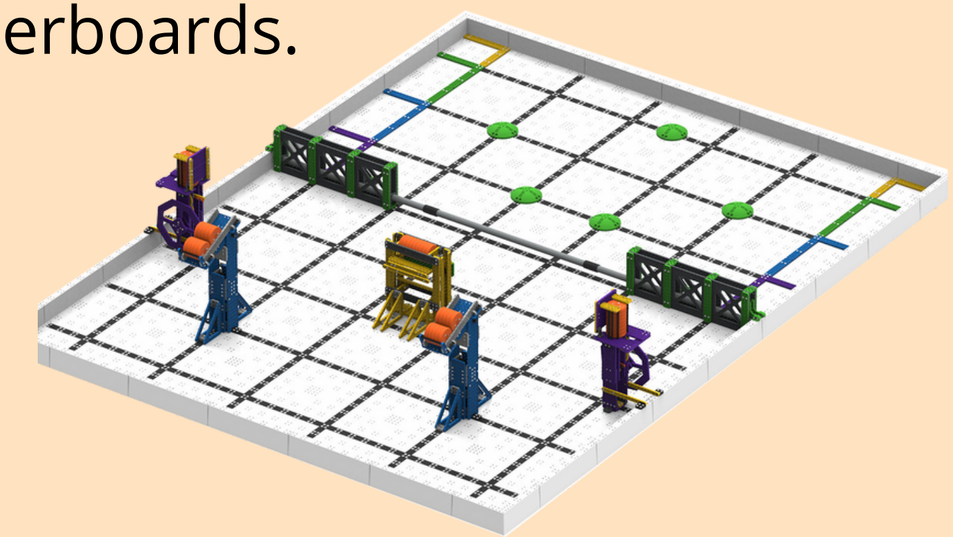
9/28/22

Presented by Rien Gupta, Kevin Li, and Rick Taylor

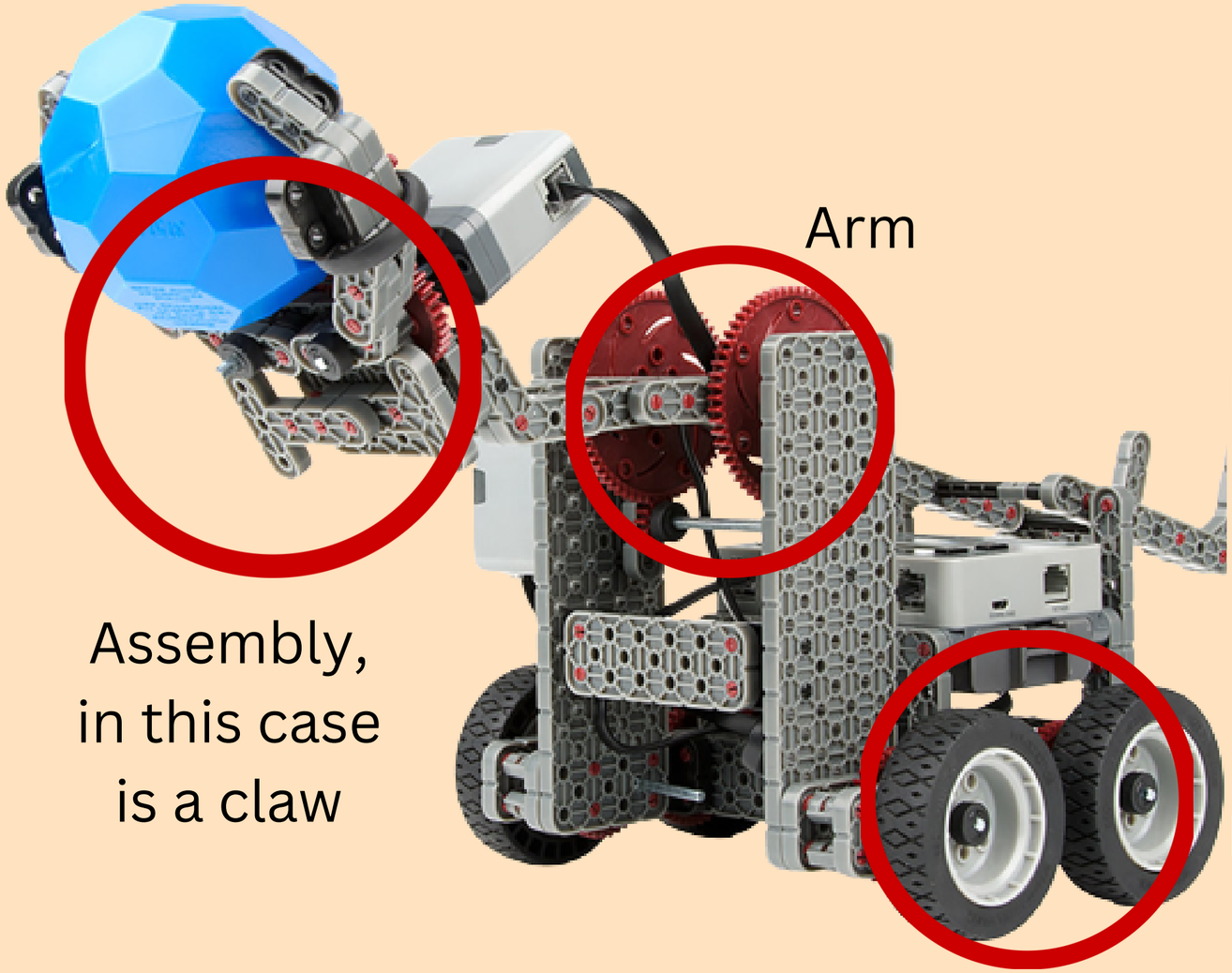
What is Vex IQ?

Similar to Legos, Vex is its own platform with special pieces and is targeted in a competition sense. With newer pieces only being released the next year, Vex is able to make kids use creativity and imagination to build robots that serve their needs. While you can make your own content, the robots Vex provides instructions for are meant to help teams commit to competing with others for awards and status on Leaderboards.





How is a robot made?



Assembly, in this case is a claw

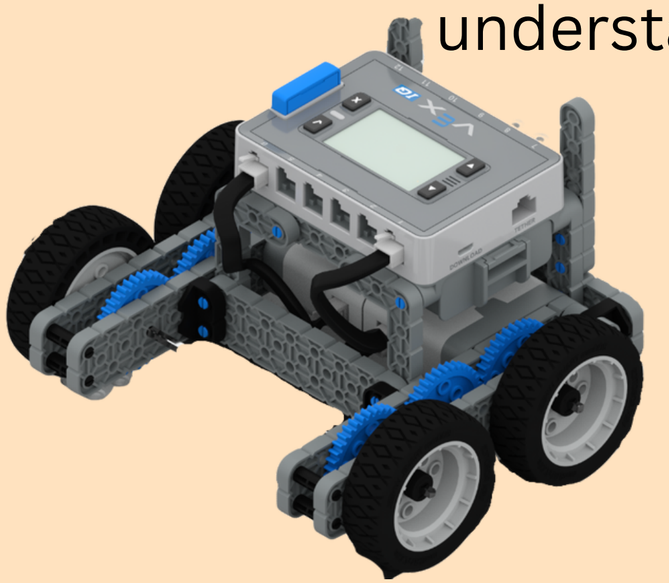
Arm

Drive Base

Using Vex IQ pieces, Vex has a numerous amount of configurations. Robots consist of a **Drive base, Arm, and Assemblies.** With the Vex game being different, teams gather around to brainstorm different ideas each year.

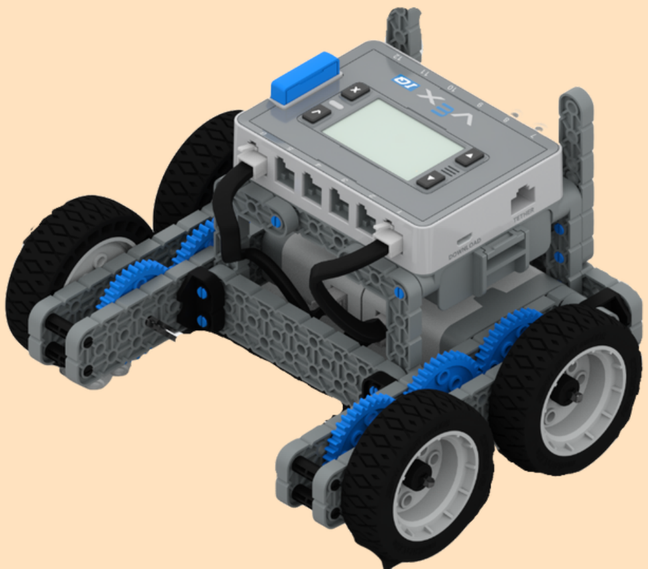
Today's topic: Drive Bases

A drive base allows a robot to be mobile by using wheels. Identifying which kind of drive base to use is one of the first considerations when designing a robot. The VEX IQ Clawbot drive base is fine for starting out, but additional drivetrain designs can allow the robot much more functionality, such as being able to move sideways in addition to turning and moving forward and backward. In order to create the advanced drive bases, you must understand some solid drive base concepts!



If you have not already...

While the drive base Vex gives instructions for is not the best, it's still great for a start. Teams can build a basic robot and then create ideas on top of it. In order to understand more complex robots, you still have to build the first drive base.



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Instructions =>

When you get there, what do you need to improve?

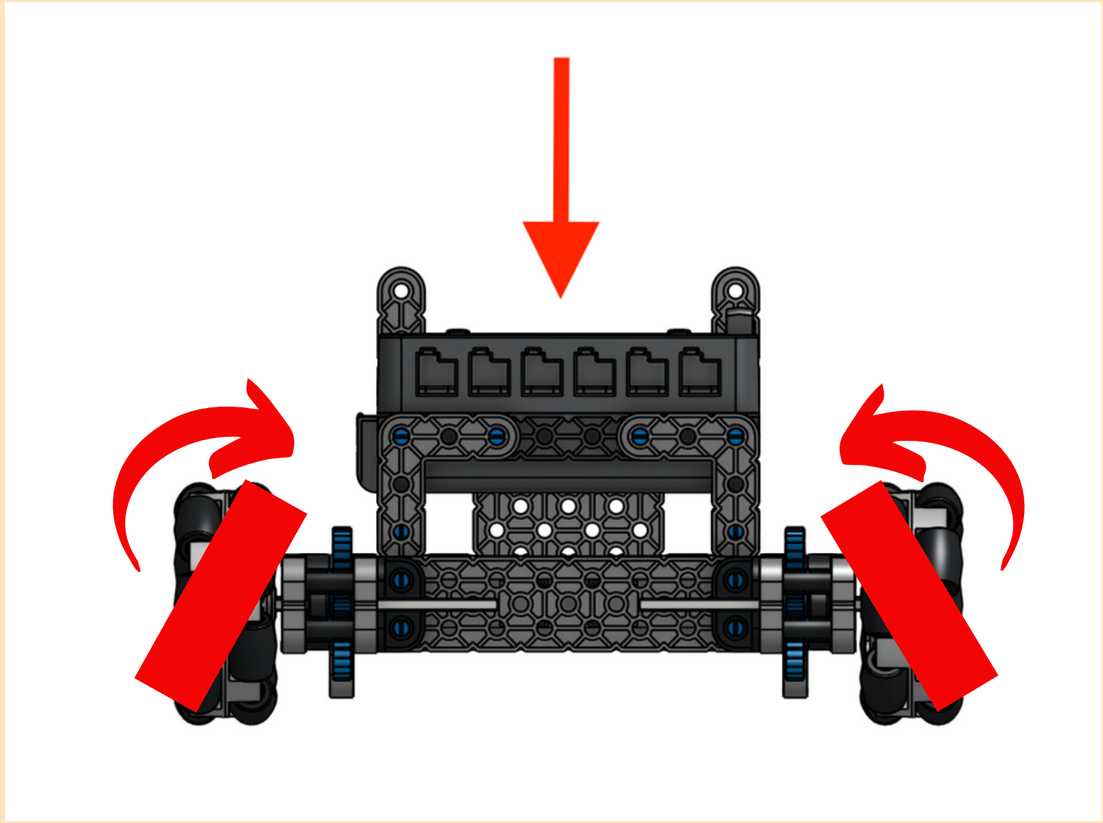
The drive base vex offers has some core problems **built-in** that Vex hopes for you to solve when you advance throughout the season. Here are the issues for teams to recognize with the basic Drive Base they place in the instructions:

1. The Drive Base is too small
2. The Drive Base is relatively slow
3. The Drive base is very flimsy, making it hard to place heavy objects on top

These problems occur due to the center of balance. Let's talk about it!

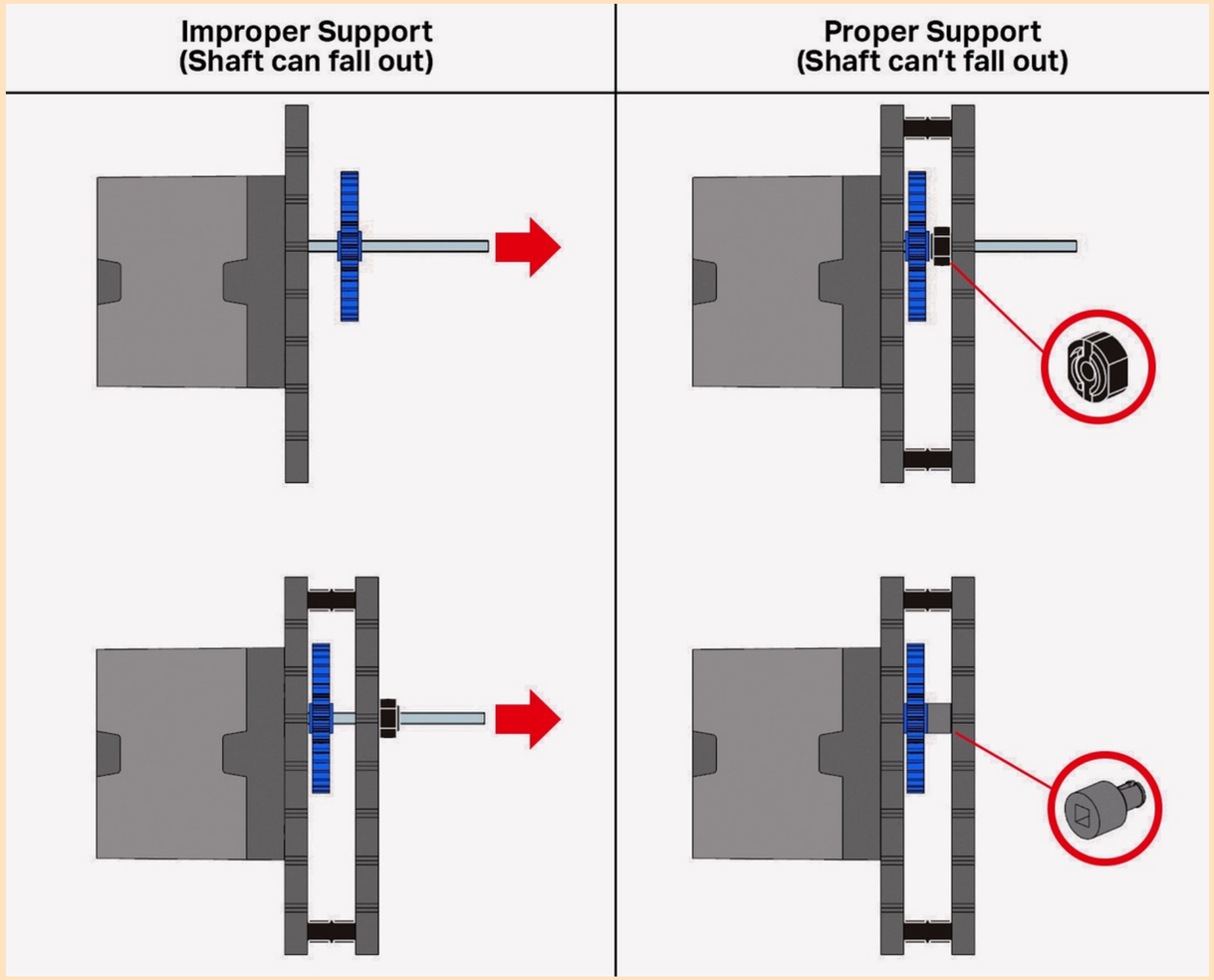
Center of Balance

The Center of Balance is the drive base's main point for weight distribution. Considering the original drive base does not have great construction techniques, the center of balance is the middle area of the robot. The center of balance on the basic robot is weak, hence the functions hanging off the side of it. When the center of balance is lackluster, the wheels will start to swerve inwards and create an unwanted flex, which will eventually lead to breaking robots. Let's talk about the important concepts to avoid drive bases from breaking



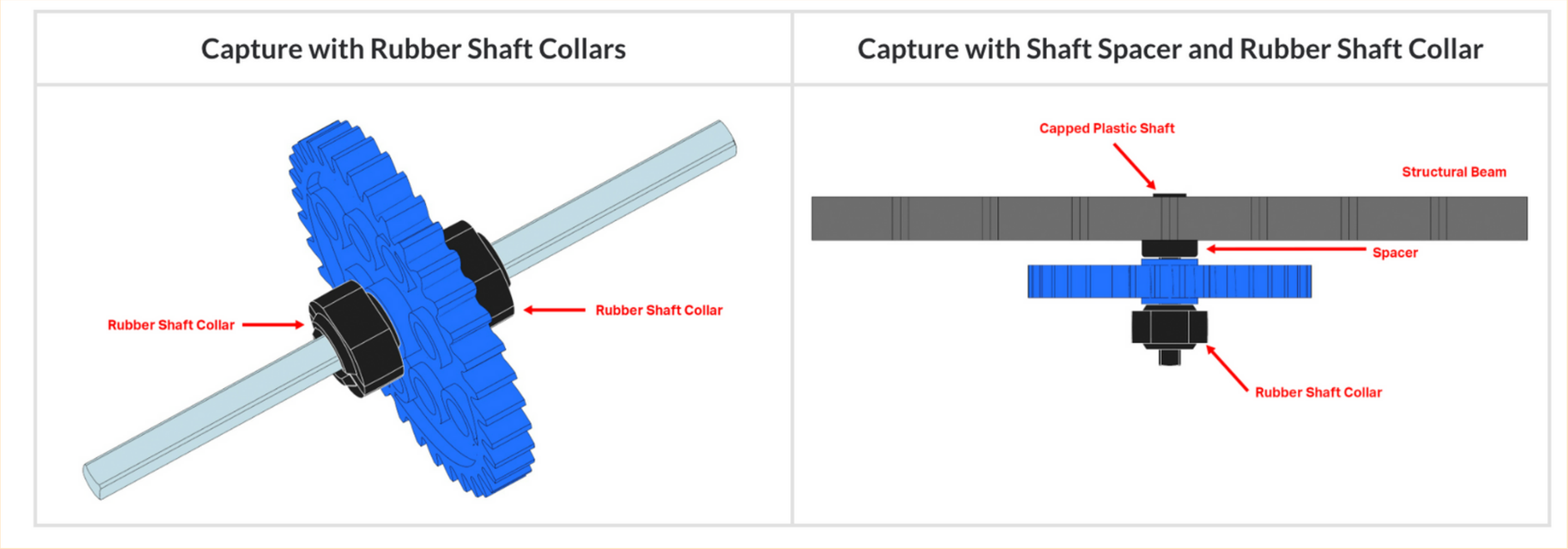
Important concepts

1 Proper Support for your beams



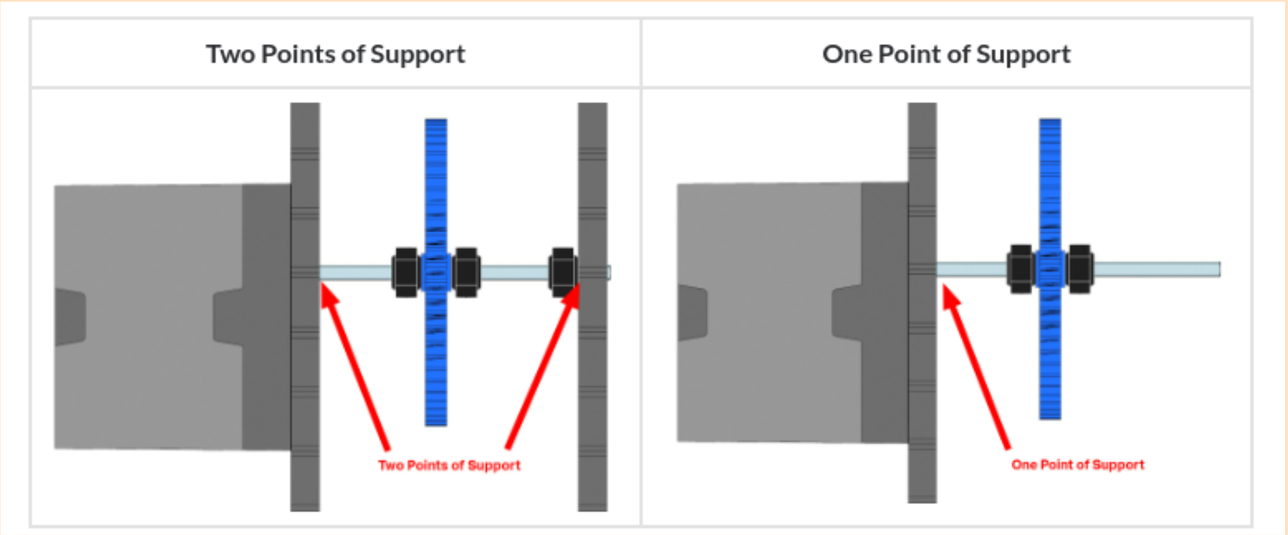
Important concepts

1. Proper Support for your beams
2. Capturing Gears on Axels



Important concepts

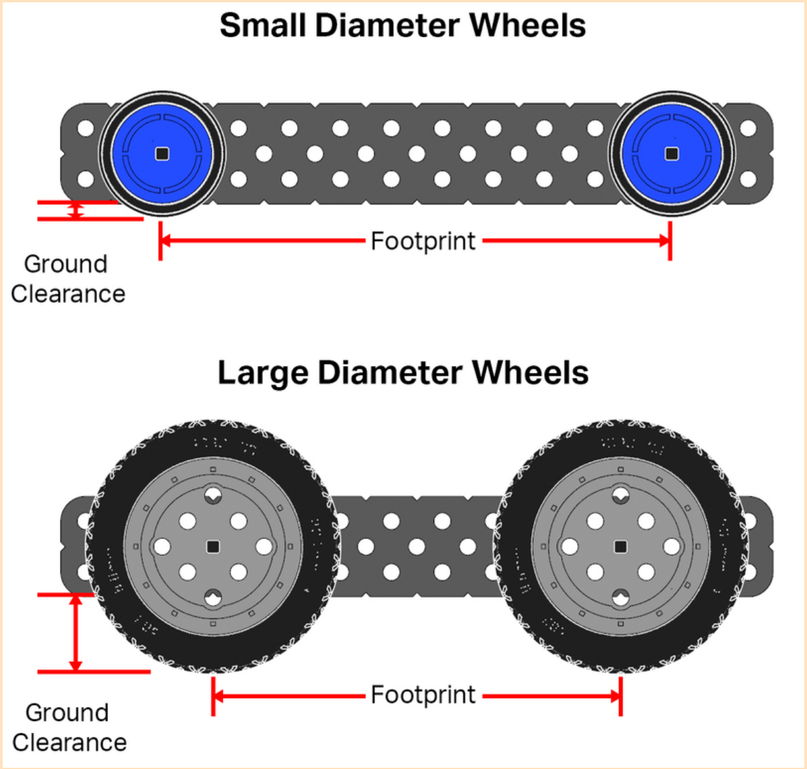
1. Proper Support for your beams
2. Capturing Gears on Axels
3. Multiple points of support for axels



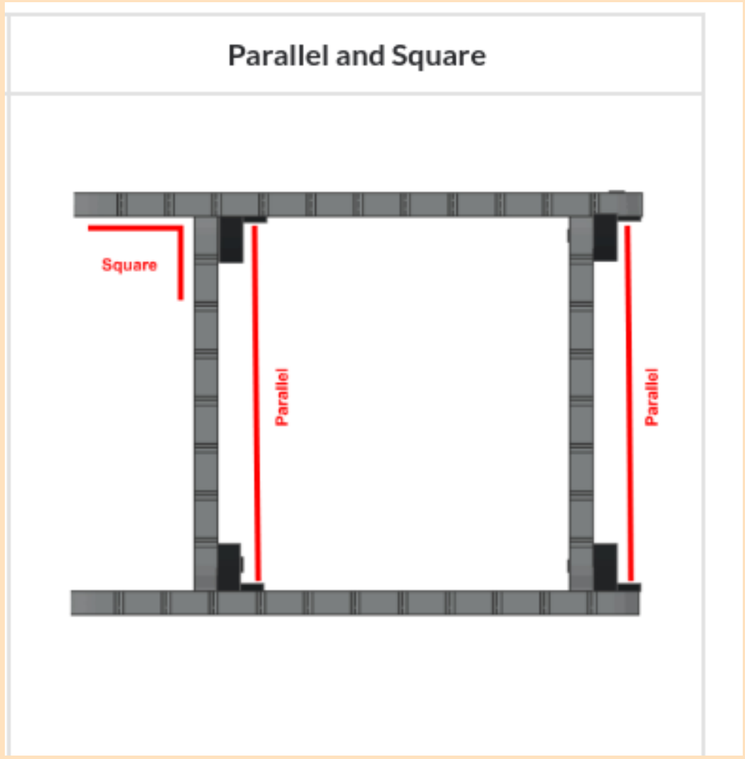
Important concepts

Hub/Tire	Distance per Revolution	Footprint	Ground Clearance	Traction
20mm Pulley/ 100mm Tire	100mm (3.94 inches)	Large	Small	Fair
Small Wheel Hub/ 160mm Tire	160mm (6.30 inches)	Medium	Medium	Very Good
Small Wheel Hub/ 200mm Tire	200mm (7.87 inches)	Medium	Medium	Very Good
Large Wheel Hub/ 250mm Tire	250mm (9.84 inches)	Small	Large	Very Good
200mm Omni-directional Wheels	200mm (7.87 inches)	Medium	Medium	Good
5x Pitch Diameter Balloon Tire (2nd gen only)	200mm (7.87 inches)	Medium	Medium	Very Good
2x Wide 3.5 Pitch Diameter Balloon Tire (Trapezoid Offroad Tread)	140mm (5.5in)	Medium	Medium	Very Good

1. Proper Support for your beams
2. Capturing Gears on Axels
3. Multiple points of support for axels
4. Vex IQ Wheel placements



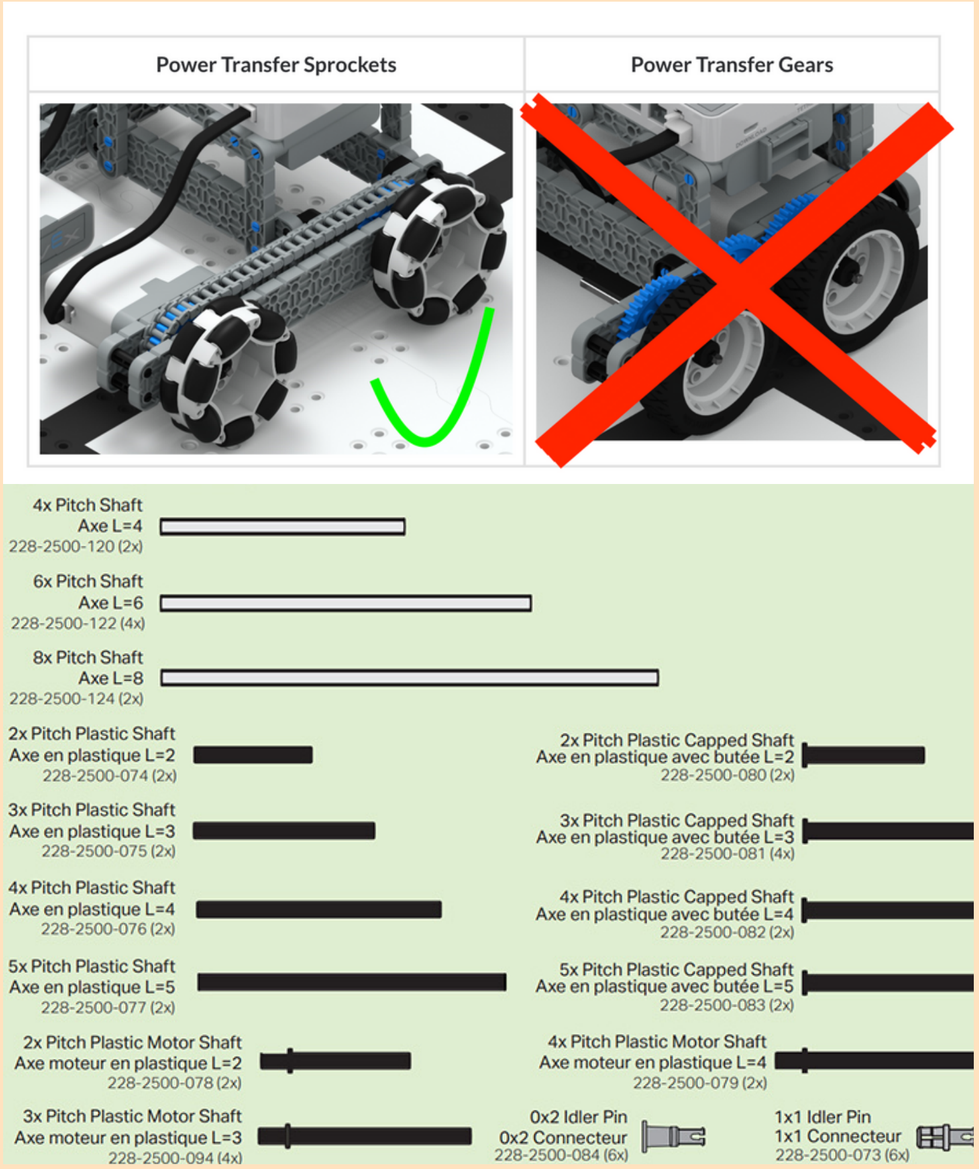
Important concepts



1. Proper Support for your beams
2. Capturing Gears on Axels
3. Multiple points of support for axels
4. Vex IQ Wheel placements
5. Everything needs to be parallel. BENDING IS BAD

When Building...

1. *Use Sprockets and Chains when building longer distance mechanisms*
2. *Consider using different axels to make your drive base stronger (hint: METAL)*
3. *Have fun! Don't forget to make the meeting interesting and bring out creativity!*



Final Result: A Beyond Solid Foundation!

All Drive bases should have 4 wheels and be able to run at any pace you want to, depending on the wheels. The drive base should be structurally sound and ready to tackle Slap shot!

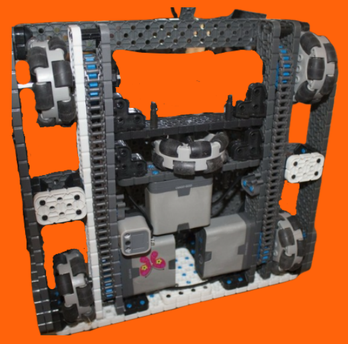
Any questions?

Next topic will be advanced topics, so feel free to head out if you don't want to participate in more advanced drive bases or have any more questions!

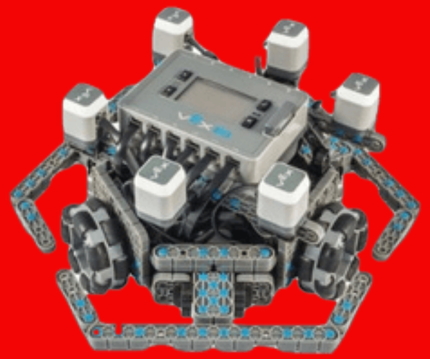
Advanced Drive Bases

Regular Drive Base

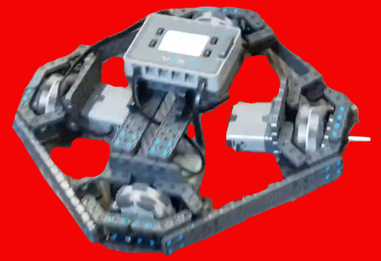
H-Drive Base



Kiwi Drive Base



X-Drive Base



Functionality

The basic Drive Base Vex provides instructions for only offers the ability to go forward, backward, and turn 360. While being useful functions, many teams use greater creativity to make advanced Drive Bases, let's take a look compare the original Drive Base to the first Drive Base, the H-Drive Base.

The H-Drive vs The O.G.

The original drive base is the drive base talked about in the previous slideshow, while the H-Drive base is a similar base with new guts!

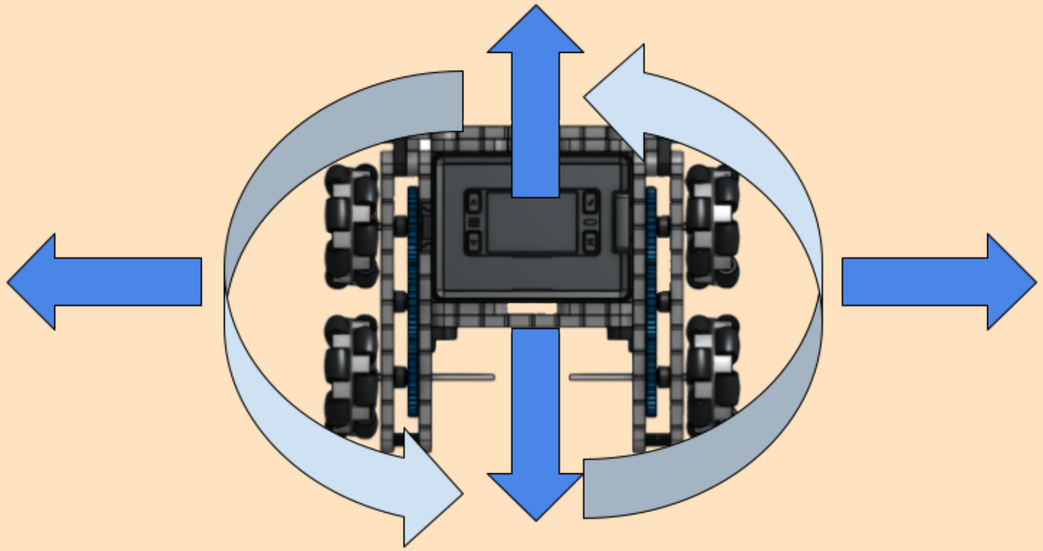
The original Drive base can:

1. Can move forward and backwards
2. Can turn 360° and only needs 2 motors

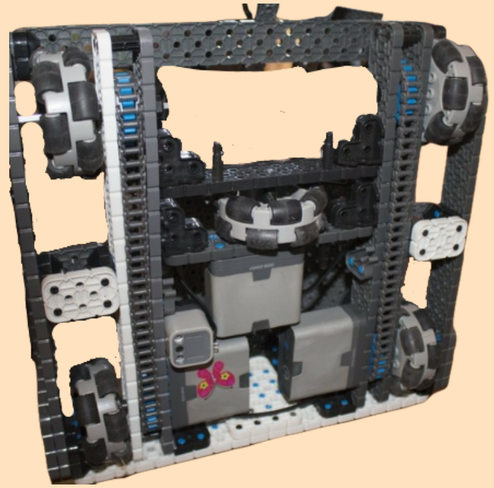
The H-Drive base can:

1. Can move forward and backwards
2. Can turn 360° and only needs 3 motors
3. **Can move sideways!**

So what is an H-Drive?

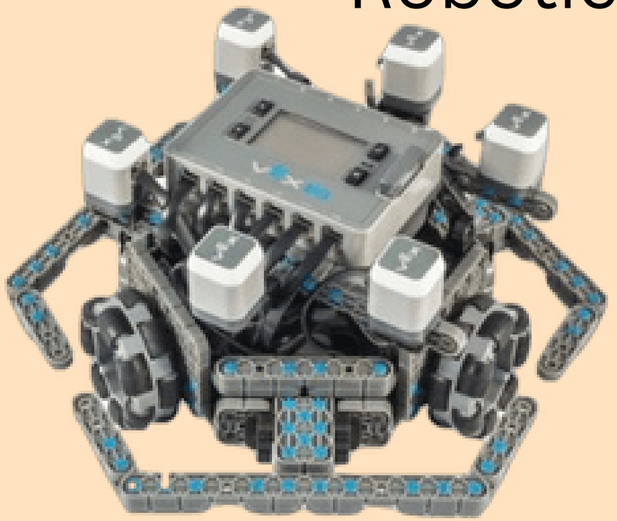


An H-Drive Base is a Drive base that is very similar to a regular drive base. This robot uses a third motor and a 5th omnidirectional wheel to move sideways. To create a drive base like this, you will have to make a bigger frame for your base and add a motor in the middle to spin it If you would like to move more directions, let's take a look at holonomics!

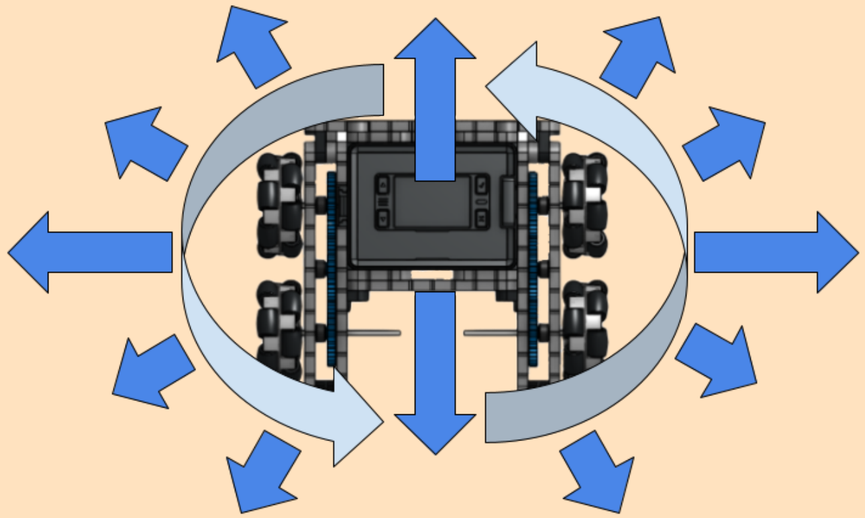


Holonomic Drive Bases

Holonomic Drive Bases are Drive Bases that require some advanced techniques to work out. Today, we are going to be discussing the main two holonomic drive bases found in Vex Robotics, the X-Drive and the Kiwi Drive Base.



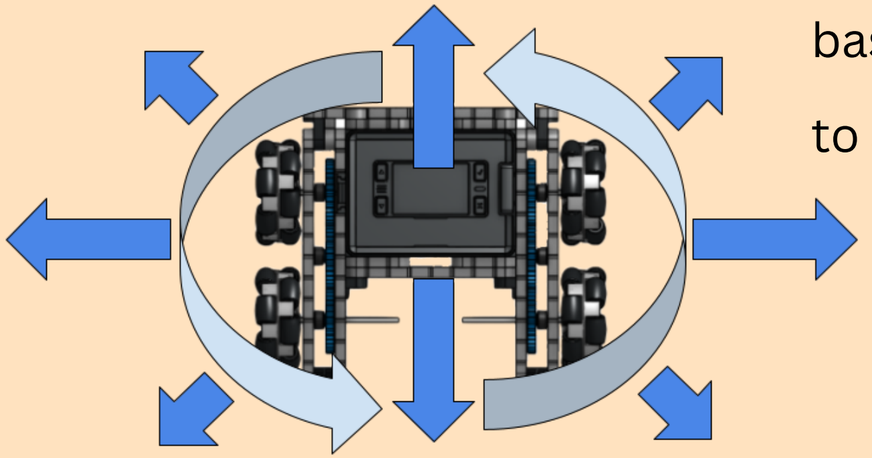
Kiwi Drive Bases



A Kiwi Drive Base is a very interesting drive base. This drive base is an amazing-advanced drive base for teams to consider building. With instructions being provided by Vex, this robot has the ability to go forward, backwards, turn 360°, and move diagonally for every movement on a clock! Check out these instructions for more!

X-Drive Base

The X-Drive Base is a very complex drive base that requires some pretty advanced skills to master completely. This drive base is a force to be reckoned with as it requires 4 motors and can go very fast! There are no clear instructions online, but this drive base is a motor attached to a wheel sloped to an angle of 45° for each side.



Why is everybody not building these bases?

While these bases are useful, each have their own caveats. The H-Drive base only offers the sideways functionality, which may not be useful in some games. The Kiwi Drive base is not very strong, as the three motors powering it have wheels that face outwards. The X-Drive base has a similar problem AND it requires 4 motors. While these drive bases have game deciding cons, we do not want anyone to break their creativity, as these drive bases are extremely useful in the right hands!

Thanks for attending!