

Q&A

VEX V5 Robotics Competition 2024-2025: High Stakes

Tagged: R10

Welcome to the official VEX V5 Robotics Competition Question & Answer system, where all registered teams have the opportunity to ask for official rules interpretations and clarifications. This Q&A system is the only source for official V5RC High Stakes rules clarifications, and the clarifications made here from the Game Design Committee (GDC) are considered as official and binding as the written [Game Manual](#) itself.

Please review the [Q&A Usage Guidelines](#) before posting. This system is only intended for specific V5RC High Stakes rules questions.

- For event, registration, or other competition support questions, please contact your [REC Foundation Regional Support Manager](#).
 - For VEX technical support, contact support@vex.com or sales@vex.com.
- For game questions, suggestions, or concerns outside of specific and official rules questions, contact GDC@vex.com.

Index

[Plastic Limit](#)

[<VUR6> Clarification](#)

[Is PETG a legal material under R10?](#)

[License Plate Placement](#)

[License plates for functional purposes](#)

[Opposing Color License Plate obscured but not fully covered](#)

[Does license plate not backed by any legal functional structure contacting ladder satisfy AWP criteria](#)

[Is tape allowed to have less friction?](#)

985: Plastic Limit

23-Dec-2021

R10

Hello,

With the recently answered [Q&A 975](#), the community has a few questions on how much polycarbonate teams are allowed to use.

[Q&A 975](#)

The intent of the rule is that all of the parts which are cut would theoretically nest into a single 12"x24" sheet. Teams are not required to literally use a single 12"x24" sheet of plastic. **Yes, this is functionally the same as saying that the total surface area of all parts must not exceed 288 square inches.**

[R7-f from Nothing but Net Q&A 1](#) (this is R10 in the Tipping Point manual)

Q. Example for Question 2: Let's say I start with a 12" x 24" sheet of allowable plastic, and cut two 12" x 11" rectangular pieces for use on a robot. This leaves me with a 12" x 2" piece of plastic left, this piece having an area of 24 square inches. I then get out a new 12" x 24" sheet of plastic (identical to the previous sheet) and cut from it a circle with a 4" diameter (having an area of ~12.56 square inches) for use on the same robot. This circle could not have been cut from the remaining piece of sheet 1, but is lesser in area than that piece, and the total area of all pieces used on the robot (the two 12" x 11" rectangles plus the 4" diameter circle) is less than the area of a single 12" x 24" sheet. Would this be legal under <R7f>?

A. No, this would not be legal. These three pieces could not be reassembled into a single 12" x 24" sheet.

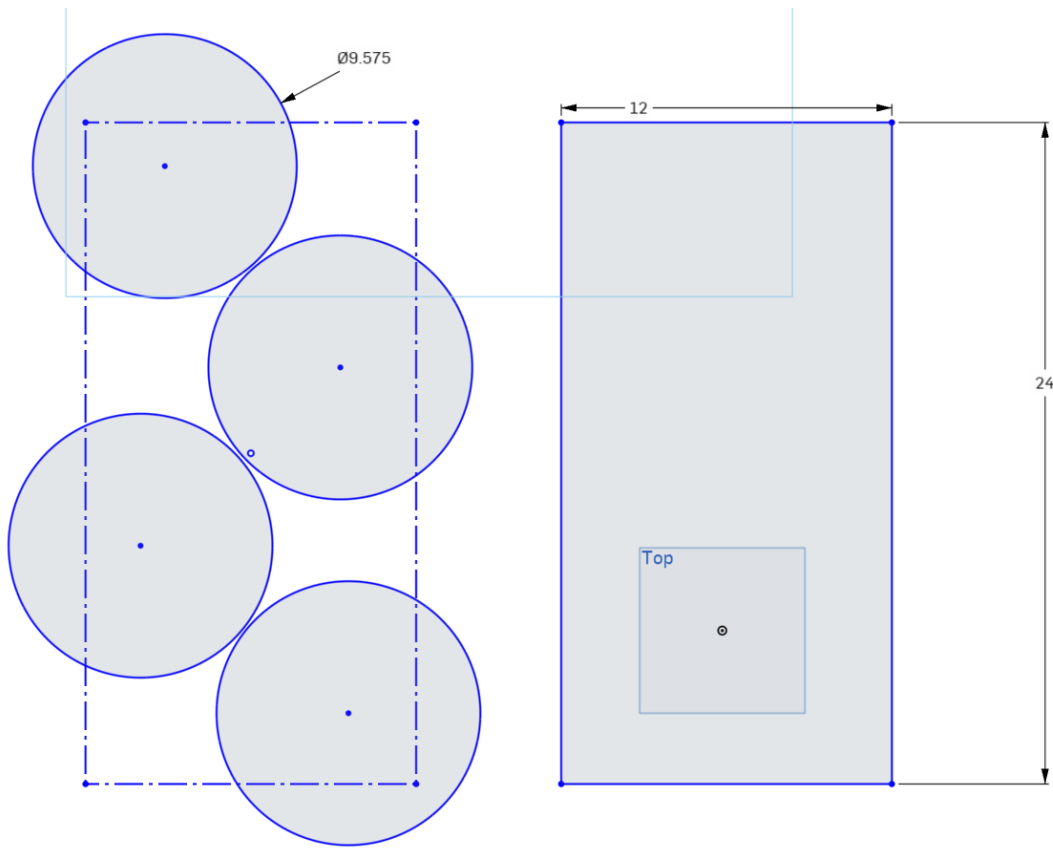
[R7-f from Nothing But Net Q&A 2](#) (this is R10 in the Tipping Point manual)

When using plastics, all pieces used must be able to be assembled into a sheet no longer than 12"x24". This is different than a maximum total area.

Attached are two images, both rectangles are 12"x24". The highlighted portions of both sheets are equal in surface area, but the left couldn't be reassembled into a 12"x24" sheet.

1. Is the plastic limit based on reassembling parts into a 12"x24" sheet, or is it based on total surface area?
 - a) If it's based on surface area, how are holes within parts accounted for? Are holes/pocketing subtracted from the total surface area of the part?
 - b) How should competitors prove the surface area of complex parts to inspectors and referees?

Thank you for your time!



Answered by committee

Thank you for bringing this to our attention and for attaching an example image. It turns out that "theoretically nesting into a single 12"x24" sheet" is *not* functionally the same as the total surface area exceeding 288 square inches. The answer to Q&A 975 has been updated, and R10 will be clarified further in a future Game Manual update.

1. Is the plastic limit based on reassembling parts into a 12"x24" sheet, or is it based on total surface area?

The former. However, the other portion of the answer from Q&A 975 is still correct - Teams are not required to literally use a single 12"x24" sheet of plastic.

- b) How should competitors prove the surface area of complex parts to inspectors and referees?

The intent behind the requirement being "nest into a single sheet" instead of "288 square inches" is specifically to reduce complexity during inspection. In most cases, inspectors should be able to tell "at a glance" whether a given Robot is exceeding the permitted area (such as having four 9.5" diameter circles).

If a Robot is "pushing the limit", such as by having many small CNC'd parts that are nested perfectly to fit in a 12"x24" space, it would be within an inspector's authority to request a demonstration or documentation of the parts' legality. We would not expect this request to be an issue, for Teams who are abiding by the rule; generally speaking, a Team who is pushing the limit to this extent knows that they are doing so, and this type of detailed Robot design work is a perfect example of documentation that should be included in an Engineering Notebook anyways.

We are not going to mandate a specific form of documentation or proof; however, suggested examples could be CNC router drawings, BOMs that match labeled parts on the robot, or even a photo of all plastic parts disassembled and laid on a 12x24" area.

Ultimately, this is similar to the answer from the ["Commercially Available Hardware"](#) Q&A. In most cases, it shouldn't require detailed discussion, but it is well within an inspector's authority to determine whether a Team's supporting documentation / evidence are satisfactory. If Team is unwilling or unprepared to oblige with this request, then it is probably a good sign that the spirit of the rule is not being followed.

708: <VUR6> Clarification

7-Dec-2020

R6 R7 R8 R10 R12 R20 R22 VUR2 VUR3 VUR5 VUR6 VUR8

In this previous ruling, it was determined that <VUR5> takes priority over <VUR6>:

<https://events.vex.com/VEXU/2020-2021/QA/674>

However, this is contradictory to every other instance of past rulings regarding <VUR6> and the wording of <VUR6> in the game manual.

?

For example, consider a typical custom sensor such as the pixy camera:

<https://www.robotshop.com/en/charmed-labs-pixy-2-cmucam5-image-sensor.html>

This sensor violates <R6>, <R7>, <R8>, <R10>, <R12>, <R20>, <R22>, as well as <VUR3> and <VUR8>.

VUR3 restricts the materials allowed, but this sensor violates the allowed materials.

VUR8 restricts the screw sizes allowed, but this sensor may have smaller screws than the allowed limit.

As another example, consider a vex IQ sensor: <https://www.vexrobotics.com/228-3014.html>

This sensor would violate <R6>, <R7>, <R8>, <R10>, <R12>, <R20>, <R22>, as well as <VUR3> and <VUR2b>.

<VUR2b> restricts teams from using any vex IQ electronics, which would include this sensor.

?

Because <VUR6> specifically states "There is no restriction on sensors and other additional electronics that Robots may use for sensing and processing" it has been understood by most VexU teams that <VUR6> takes priority over all the other rules in the game manual. Logically this would also mean <VUR6> would take priority over <VUR5>.

?

Several other Q/As over the years have verified this as correct as the wording on <VUR6> has not significantly changed since these rulings:

<https://www.vexforum.com/t/answered-vexu-speakers-as-part-of-custom-sensor/42312>

<https://www.vexforum.com/t/answered-vex-u-old-college-q-a-updates/23810>

<https://www.vexforum.com/t/answered-custom-sensor-housing/19582/2>

These three Q/As verify that <VUR6> would take priority over <VUR3> and <VUR8> as well as all the regular game manual rules mentioned above.

Furthermore, the following Q/A shows that <VUR6> would also take priority over <VUR5>:

<https://www.vexforum.com/t/answered-vex-u-non-vex-servo-motors-for-a-custom-sensor/35538>

This allowed external non vex motors used solely for manipulating custom sensors.

If this were the case, it would agree with the wording of <VUR6>. There are numerous sensors and processing boards that rely on motors to operate.

For example, many full field lidar systems such as:

<https://www.robotshop.com/en/rplidar-a1m8-360-degree-laser-scanner-development-kit.html>

rely on an integrated motor to spin the lidar enabling it to map the field. VexU teams have legally used similar lidar systems in the past and may plan to do so again this season.

Another example would be the Nvidia Jetson Xavier NX listed below:

<https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/jetson-xavier-nx/>

This processing board has a built-in fan on its heatsink that is critical to its function as a processing unit.

A third example is the pixy tilt and pan kit: <https://pixycam.com/pixy2-pan-tilt-kit/> (ruled legal in the above Q/A linked).

Without these integrated motors, none of these sensors or processing units could function as intended.

?

Therefore, which rules, if any, restrict the "no restriction" clause of <VUR6>?

Furthermore, if <VUR5> does not apply to <VUR6>, then was the previous ruling in QA#674 an error?

If <VUR5> is applicable, are 360-degree Lidar sensors and the Nvidia Jetson processing boards also illegal? If all VexU appendix rules also apply to <VUR6>, then does that mean that there are no legal VexU custom sensors?

Answered by committee

If all VexU appendix rules also apply to <VUR6>, then does that mean that there are no legal VexU custom sensors?

Please see rule G3:

<G3> Use common sense. When reading and applying the various rules in this document, please remember that common sense always applies in the VEX Robotics Competition.

The intent of the answer in the linked Q&A was to prohibit using VUR6 as a loophole to install cooling fans on a Robot.

Sensors containing an internal motor which is integral to their operation, such as a LIDAR or pan-tilt Pixy, would be permissible. It would not be feasible for an inspector to take apart a LIDAR module to see if there is a motor inside of it. It is, however, feasible for an inspector to check if a fan is being used to cool a V5 Smart Motor.

To prevent confusion, we would advise Teams with external processors that require thermal protection to utilize a [passive heat sink](#) instead of an active cooling fan.

682: Is PETG a legal material under R10?

28-Oct-2020

R10

R10 and VUR3a both list "PET" as legal plastics for use in VRC and VEXU, respectively. Does this mean only PETE, or does it also include other PET-type plastics such as PETG?

PETG is a commonly-used material in FDM 3D printing, so is already legal in VEXU for that purpose under VUR3d. However, for the purposes of this question I'm interested in the legality of VRC teams making custom parts from legal-size PETG sheets under R10, or VEXU teams making custom parts from PETG stock of any size under VUR3.

(Although this question asks about both VRC and VEXU, I posted it in the VRC Q&A because the list of legal materials is exactly the same in both rules, and thus I assume the answer will be the same for both.)

Thanks!

Answered by committee

Yes, PETG would be considered a "PET-type" plastic for the purposes of R10 and VUR3-a, assuming that it is being utilized within the same intent as the respective rules of each program.

That is to say - in VRC, governed by R10, it would need to have been cut from a single 12" x 24" sheet up to 0.070" thick. Utilizing PETG as a 3D printer filament would still not be permissible, just as using any of the other materials listed in R10 as a 3D printer filament would not be permissible.

2451: License Plate Placement

21-Jan-2025

R10

[<R10>](#)

R10, a) License plates must be placed on a minimum of two (2) horizontally opposing sides of the Robot (i.e., the top of a Robot is not considered a "side"), and must remain visible and attached for the entirety of the Match.

We were told at a recent event that having our plates on the left and right side of our robot with both facing up (at the ceiling - like TV numbers on a football uniform) was an illegal placement - the inspector quoted R10a listed above.

We believe that the definition of opposing horizontal faces would be met if one of the plates was just slightly higher than than the other --- Thinking of the planes as figuratively a couple of slices of cheese in a sandwich - with one plate imbedded in slice of cheese and the other in the slice just a few millimeters above it.

If the plates are clearly visible to the referee, one on the left side of the robot and one on the right side - facing up as described, is our interpretation correct?

Answered by committee

If the plates are clearly visible to the referee, one on the left side of the robot and one on the right side - facing up as described, is our interpretation correct?

No. Imagine the robot as a cube that's sitting flat on a flat surface. License plates should be placed onto two (2) opposing faces of that cube (excluding the top and bottom).

2416: License plates for functional purposes

27-Dec-2024

R7 R9 R10

My question is whether visible license plates and additional painted plates can be used for functional purposes.

R10 says "license plates are considered non-functional decorations" but rule R7 says "Product pages on the VEX Robotics website should be used as the official definitive source for determining if a product is a V5 component," so because the official license plates are listed as V5 components on the store page they are considered legal parts. I am only asking about the official vex license plates from the V5RC License Plate Kit (part number SKU 276-3938)

These seem to be conflicting rules. So can you use license plates for functional purposes or strictly decoration. Is it possible to use additional plates that are painted black (assuming additional plates are painted in compliance with r9 and r10) and have the additional ones be functional while also having separate plates only used for decoration?

Answered by committee

Per clause C of rule [<R10>](#), License Plates are non-functional decorations, and must fulfill all relevant Robot rules. License Plates cannot be used as functional parts on a Robot for the VEX V5 Robotics Competition, whether they're

| painted black, green, or any other color.

2365: Opposing Color License Plate obscured but not fully covered

9-Dec-2024

R10

[<R10>](#)

My teams are using the [linked license plate holders](#) which have a finger cutout on the top and bottom (about a 1" half circle). They also have 3D printed double colored license plates that can be flipped based on the alliance.

My question is on the definition of obscured. Is it allowable to have a clearly obscured license plate that you can see about an inch of the top/bottom and a the half moon cutout on the back of the wrong alliance color but can not see any of the text or markings from the incorrect alliance plate. This is attached to the backside of the correct color alliance plate.

Is it allowable to use an official license plate as a vanity plate without a team number on it that does not match the alliance that the robot belongs too.

Answered by committee

The final decision about whether the "wrong color" of license plate is sufficiently obscured must be made by the Head Referee for the event. In general,

Teams should strive to cover as much of the "wrong color" as possible. [This article in the REC Library](#) provides some clear examples in the section titled "Rule R9: License Plates" that can be used as guidance.

2248: Does license plate not backed by any legal functional structure contacting ladder satisfy AWP criteria

2-Nov-2024

R9 R10 SC8

[<SC8>](#) The fourth criteria says robot contacting ladder.

In R10 [<R10>](#)

License plates are considered non-functional decorations (per [<R9>](#)), and must fulfill all relevant Robot rules (e.g., they must fit within the 18" cube,

[<R9>](#)

Decorations are allowed. Teams may add non-functional decorations, provided that they do not affect Robot performance in any significant way or affect the outcome of the Match. These decorations must be in the spirit of the competition. Inspectors will have final say in what is considered "non-functional." Unless otherwise specified below, non-functional decorations are governed by all standard Robot rules. To be considered "non-functional," any guards, decals, or other decorations must be backed by legal materials that provide the same functionality.

Following the guidance of R10 and R9 we came to the conclusion that if the license plate was not there, there was no contact with the ladder.

That said, Grant might say I am overthinking it. If so, what additional considerations should we put into interpreting SC8.

Thank you.

Answered by committee

Does license plate not backed by any legal functional structure contacting ladder satisfy AWP criteria?

No.

1356: Is tape allowed to have less friction?

30-Dec-2022

VUR3 R10

Is it legal to use Scotch tape to cover sheets of plastic? The purpose would be to allow the discs to slide easier along the plastic. R10 states that tape can't be used in this way, but interpreting VUR3 e, attaching tape to the plastic falls under this rule.

Answered by committee

Yes. This would be legal under rule <VUR3e>.