

Q&A

VRC 2021-2022: Tipping Point

?????: R8

Welcome to the official VEX 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 VRC Tipping Point 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 VRC Tipping Point rules questions.

- For event, registration, or other competition support questions, please contact your [REC Foundation Manager](#).
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[Commercially Available Standoffs](#)

[Rope / String use on a IQ Robot](#)

[legality of 3d printed pneumatic tank mounts](#)

[Rubber band size](#)

[To what extent is something a non-functional decoration?](#)

[R8i and pneumatic tubing](#)

[R8 e. - string/rope clarification](#)

[R6, R7, R8 – "identical" parts & purchasing the same parts from third parties](#)

[Legal Rubber Bands](#)

[Does R8a apply to light sensors other than *the* Light Sensor?](#)

[V5 and Cortex robot inspection checklist differences](#)

[<VUR6> Clarification](#)

[USB Brain Dongle During Match Play](#)

[Rubber Band #117B](#)

[License plates that are 3D Printed](#)

[Allowed materials](#)

[Super Glue](#)

[Smart cable repair](#)

[What qualifies as "Commercially Available?"](#)

[Metal String Usage Clarification](#)

995: Commercially Available Standoffs

5-Jan-2022

R6 R7 R8 R12

Hello,

This question comes with the changes to "identical parts" and standoffs not being considered under R12.

R12

Robots may use any commercially available #4, #6, #8, M3, M3.5, or M4 screw up to 2.5" (63.5mm) long (nominal), and any commercially available nut, washer, and / or non-threaded spacer (up to 2.5" (63.5mm) long) to fit these screws.

R6, R7 and R8 do not mention standoffs as an exception for what can be used from a third party.

Are standoffs purchased from third parties legal if they are identical in all ways besides color to what VEX Robotics / VEX Robotics resellers provide?

Thank you for your time!

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Yes. R12 will be updated to include standoffs in the February 1 Game Manual update.

983: Rope / String use on a IQ Robot

21-Dec-2021

R7 R8

Can a student use rope or string on their IQ robot? I see that these parts are approved through Vex this year 228-2500-430 12x Pitch Rope, 228-2500-436 20x Pitch Rope , 228-2500-438 24x Pitch Rope and 228-2500-448 120x Pitch Rope but can the students use non official vex IQ parts like R8 e. from the V5 rule book be used? (An unlimited amount of rope / string, no thicker than 1/4" (6.35mm)).

Thank you for your help with this matter.

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can the students use non official vex IQ parts like R8 e. from the V5 rule book be used? (An unlimited amount of rope / string, no thicker than 1/4" (6.35mm)).

No.

As noted in your question, the [VIQC Legal Parts Appendix](#) provides a comprehensive list of legal VEX IQ parts. Furthermore, rule R8 (quoted below) lists all legal non-VEX IQ components. Rope/string is not included in this list; therefore, it is not legal.

<R8> Non-VEX IQ components. Robots are allowed to use the following additional “non-VEX IQ” components:

- a. Appropriate non-functional decorations, provided that these do not affect the Robot performance in any significant way or affect the outcome of the Match. These decorations must be in the spirit of the event. Inspectors will have the final say in what is considered “nonfunctional” and “appropriate”.
 - i. Any decorations must be backed by legal materials that provide the same functionality, (For example, if your Robot has a giant decal that prevents Balls from falling out of the Robot, the decal must be backed by VEX IQ material that also prevents the Balls from falling out).
 - ii. The use of non-toxic paint is considered a legal non-functional decoration. However, any paint being used as an adhesive or to impact how tightly parts fit together would be classified as functional.
- b. Rubber bands that are identical in length and thickness to those included in the VEX IQ product line (#32 & #64).
- c. “?” metal shafts from the VEX V5 product line.

977: legality of 3d printed pneumatic tank mounts

15-Dec-2021

R8

do to the nature of the SMC pneumatic components not interlocking well with the vex vrc system is the use of 3d printed or other manufactured brackets whom's purpose is only to hold a pneumatic tank legal?

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No.

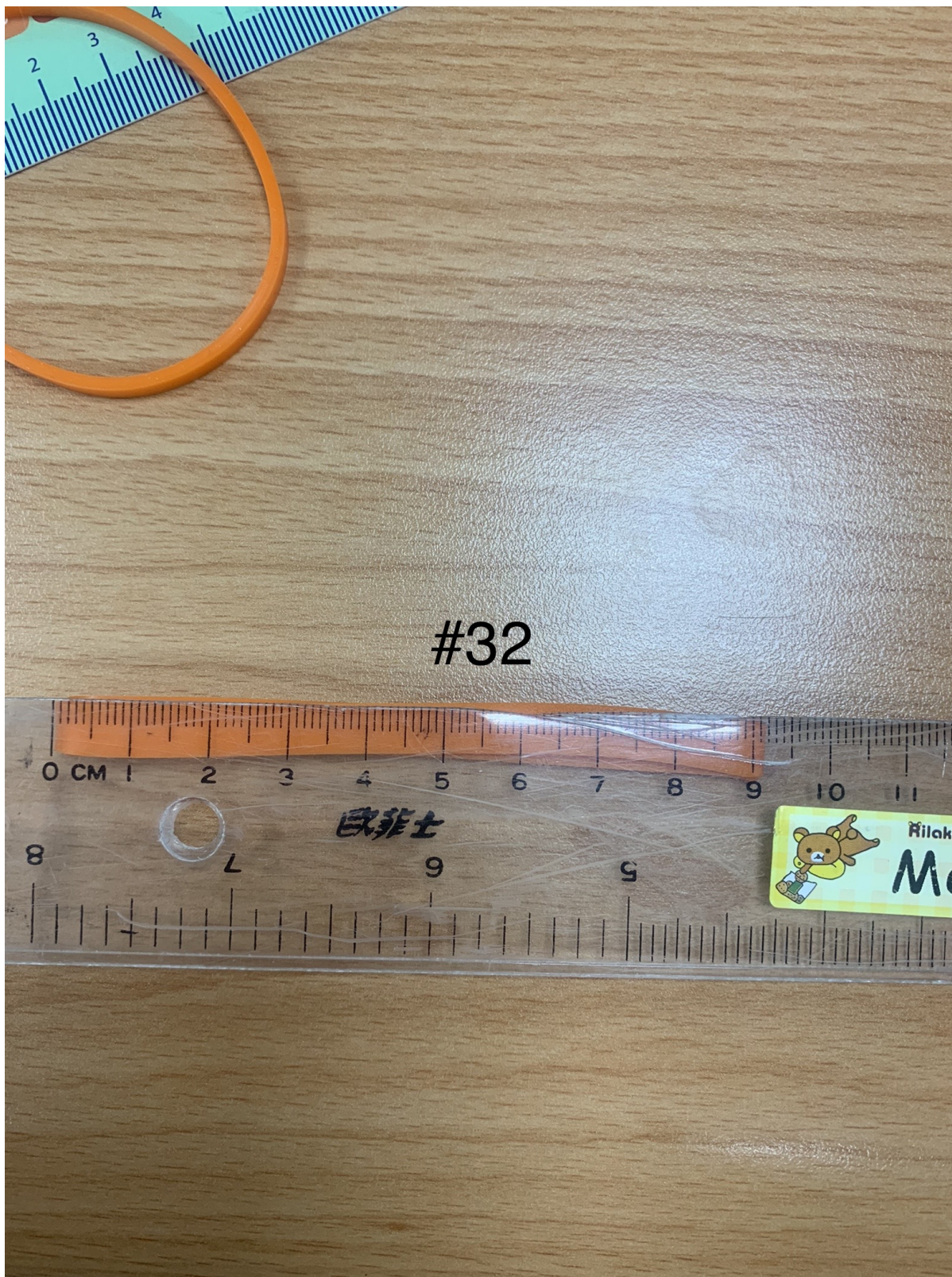
929: Rubber band size

15-Nov-2021

R8

According to VIQC rule R(8), teams are allow to use rubber bands either directly purchased from VEX or has the same dimension specified on VEX website.

However, it comes to our awareness that there are significant dimension difference between the website and the rubber band in our warehouse. How would you suggest we address this during the events?



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Per the [VEX website](#), the expected dimensions for VEX IQ rubber bands are as follows:

Rubber Band #32 (275-1089)

- Length: 3" (76 mm)
- Width: 1/8" (3 mm)
- Thickness: 1/32" (0.8 mm)

Rubber Band #64 (276-3990)

- Length: 3.5" (89 mm)
- Width: 1/4" (6 mm)
- Thickness: 1/32" (0.8 mm)

Although it is tough to tell, it appears that the rubber band in the attached image meets the nominal dimensions for a #64 size, and would therefore be legal.

In general, the reason why rubber band sizes are referred to in nominal terms (e.g. #32, #64) is because it is impossible to guarantee a rubber band's exact dimensions with 100% certainty. Rubber may expand or contract due to temperature, humidity, repeated over-stretching, etc. If students are raising concerns about the legality of their official VEX rubber bands, this could serve as a "teaching moment" to explain material properties, tolerances, etc.

The intent of R8-c is to clarify that although off-the-shelf rubber bands are permitted, searching for "the [perfect rubber band](#)" should not be a part of the design challenge. Inspectors may request measurements of rubber bands that appear to be grossly outside of the expected sizes, but measuring to millimeter precision should not be necessary.

9: To what extent is something a non-functional decoration?

16-May-2018

R8

So there has been some talk about teams painting the legal sheets of plastic red, blue, or even yellow and putting them on the sides of their robot in order to passively interfere with any vision sensor code. My question would be if this is legal or not. These types of decorations would for sure be made in such a way that it would be a legal non-functional decoration, but something tells me that the GDC does not intend for teams to do this. Do these decorations qualify under <R8>, or would they be pushing the limits on what is allowed under that rule?

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*<R8> Teams may add non-functional decorations, provided that they **do not affect the robot performance in any significant way or affect the outcome of the match.***

Robot elements which mimic visual elements of the field (such as the color pattern of the Flags), or could otherwise interfere with an opponent's Vision Sensor, clearly affect robot performance and could affect the outcome of a match. Thus, they would now be considered a functional element, and would not be permitted by R8.

This would be similar to using a giant decal. By itself, it is considered a nonfunctional decoration. However, if used to hold metal parts together or to hold game objects, it has become functional, and is no longer legal.

That being said, just as teams are responsible for the decorations on their own robots, teams utilizing the Vision Sensor should be conscious of the possibility for inadvertent or incidental visual interference. It will be up to the inspector and head referee to determine if a given robot's decoration or design acts as a "Vision Sensor distraction" or not.

R7 and R8 will be updated in the June 15th game manual update to state this more clearly.

883: R8i and pneumatic tubing

15-Oct-2021

R8

Rule R8i states: Pneumatic components with identical SMC manufacturer part numbers to those listed on the VEX website.

SMC does not sell tubing in 5' lengths 100% matching the part number on the VEX website, therefore the following questions:

1. Since SMC sells identical tubing from the TU04 25 line in 100' and 500' lengths, may teams use this tubing as long as it is cut to 5' lengths or less?
2. If the answer to question 1 is yes, may teams use tubing from the TU04 25 line in a color other than black?

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1. Since SMC sells identical tubing from the TU04 25 line in 100' and 500' lengths, may teams use this tubing as long as it is cut to 5' lengths or less?

Yes. This would mean SMC part numbers beginning with the prefix "TU0425B-". We will make sure that this is added to the VEX website, to stay aligned with R8-i.

2. If the answer to question 1 is yes, may teams use tubing from the TU04 25 line in a color other than black?

No, this is not permitted.

861: R8 e. - string/rope clarification

9-Sep-2021

R8

In version 1.0 of the Tipping Point game manual, R8 e. was updated from "An unlimited amount of 1/8" (or local metric equivalent), braided, nylon rope" to "An unlimited amount of rope / string, no thicker than 1/4" (6.35mm)."

Clarification on rope/string definition Since the rule no longer specifies the type of rope/string, what falls under rope/string in this manual. Can higher tensile strength materials be used like fishing line and steel cable?

<https://www.homedepot.com/p/Everbilt-1-4-in-x-100-ft-Galvanized-Steel-Uncoated-Wire-Rope-803132/203958865#overlay> Products like these technically fit the build restrictions because they are called "rope". Please clarify the definition for us. Personal opinion - Our team thinks it would make sense to legalize stronger tensile strength rope/strings with the introduction of 3-4 pound game elements. We think the build restrictions should scale with the difficulty of the game.

Clarification on 1/4 in. restriction In the updated rule it says the string/rope cannot be thicker than 1/4 in. Does this mean the string/rope cannot be larger than 1/4 in. in diameter or radius?

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Can higher tensile strength materials be used like fishing line and steel cable?

Yes, these examples would both be legal, provided that they do not pose a risk of violating rules S1, G12, or R4 (i.e. a safety or Entanglement risk).

In the updated rule it says the string/rope cannot be thicker than 1/4 in. Does this mean the string/rope cannot be larger than 1/4 in. in diameter or radius?

The string/rope should be no thicker than 1/4" at any point, i.e. measuring the thickness with a pair of calipers should never read more than 1/4". We are using the term "thickness" instead of "diameter" because the rule does not require the string/rope to be round.

812: R6, R7, R8 – "identical" parts & purchasing the same parts from third parties

22-Jun-2021

R8

<R6> **Robots are built from the VEX V5 system.** Robots may be built ONLY using official VEX V5 components, unless otherwise specifically noted within these rules. Teams are responsible for providing documentation proving a part's legality in the event of a question. Examples of documentation include receipts, part numbers, official VEX websites, or other printed documentation.

<R8> **Certain non-VEX components are allowed.** Robots are allowed the following additional "non-VEX" components: [omitted for brevity]

For many years, there has been a clause in R8 allowing parts which are "identical" to official VEX products. There is no such clause in version 0.2 of the Tipping Point game manual.

<R7> **VEX products come from VEX Robotics or VEX Robotics Resellers.** Official VEX products are ONLY available from VEX Robotics & official VEX Resellers. To determine whether a product is "official" or not, consult www.vexrobotics.com. A complete list of authorized VEX Resellers can be found at <https://www.vexrobotics.com/how-to-order>.

Some products in the V5 product line are not manufactured by VEX, but rather purchased in bulk from third-party manufacturers and resold by VEX and VEX-authorized resellers. Often these same parts can be purchased directly from the manufacturer or through other retail sites. Two common examples are "VEX-brand rubber bands" (manufactured by [Alliance](#)) and VEX pneumatics kits, which contain components made by [SMC](#).

Purchasing these products from non-VEX sources can provide significant cost savings. For example, VEX sells #64 non-latex rubber bands in a pack of 10 for \$3.99, or 39.9 cents per band. However, the same rubber bands are [available on Amazon](#) in a 1 lb box (approx. 380 bands) for \$15.84, or roughly 4.2 cents per band, a savings of nearly 90%. Purchasing the same quantity of rubber bands from VEX would cost over \$150.

Likewise, purchasing individual pneumatic components directly from SMC or from third-party retailers can provide significant cost savings compared to buying kits from VEX, depending on what and how many parts a team needs.

In both these cases, purchasing parts from non-VEX retailers doesn't just get you parts that are "identical" for some definition of that term. These are literally the same parts, simply routed through a different set of warehouses on the journey from the factory to a team's robot. There is no competitive advantage to be gained here, only a cost savings.

In previous seasons, buying these parts from non-VEX retailers would've definitely been allowed under the "identical parts" clause; however that clause is no longer present.

With this context in mind, I have the following questions:

1. Was the omission of the "identical parts" clause in R8 intentional?
2. If the answer to #1 is yes, are teams allowed to purchase the same components (where applicable) from non-VEX retailers such as SMC or Amazon?
3. If the answer to #2 is no, how will inspectors be expected to verify (and teams expected to prove) that, for example, a particular rubber band or pneumatic cylinder was purchased from VEX or a VEX reseller rather than from a third party?

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1. Was the omission of the "identical parts" clause in R8 intentional?

Yes.

2. If the answer to #1 is yes, are teams allowed to purchase the same components (where applicable) from non-VEX retailers such as SMC or Amazon?

Yes.

3. If the answer to #2 is no, how will inspectors be expected to verify (and teams expected to prove) that, for example, a particular rubber band or pneumatic cylinder was purchased from VEX or a VEX reseller rather than from a third party?

Rubber bands that are identical in length and thickness to those sold by VEX, and SMC-branded pneumatic components with equivalent part numbers to those sold by VEX, are the only permissible exceptions to this rule. We will make sure to address these exceptions in a future Game Manual update.

808: Legal Rubber Bands

12-Jun-2021

R8

<R7> VEX IQ product line. Robots may be built ONLY from Official Robot Components from the VEX IQ product line, unless otherwise specifically noted within these rules.

- a. Official VEX IQ products are ONLY available from VEX Robotics & official VEX Resellers. To determine whether a product is "official" or not, consult www.vexiq.com.

If there are commercially available rubber bands that are identical to VEX IQ rubber bands, would those be legal for competition? If not, what are the best practices for inspection to ensure the the rubber bands were purchased from VEX?

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Please see rule R8-b, as updated in version 0.2 of the Game Manual:

<R8> Non-VEX IQ components. Robots are allowed to use the following additional "non-VEX IQ" components:

[...]

- b. Rubber bands that are identical in length and thickness to those included in the VEX IQ product line (#32 & #64).

740: Does R8a apply to light sensors other than *the* Light Sensor?

8-Feb-2021

R8

R8 Certain non-VEX components are allowed. Robots are allowed the following additional "non- VEX" components:

- a. Any material strictly used as a color filter or a color marker for a VEX Light Sensor.

Does "VEX Light Sensor" in R8a describe only the "VEX Light Sensor" (276-2158), or does it also include other VEX sensors that "sense light", such as the Line Tracker (276-2154) or the new V5 Optical Sensor (276-7043)?

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Yes, the Line Tracker and V5 Optical Sensor would be covered by R8a.

71: V5 and Cortex robot inspection checklist differences

10-Sep-2018

G3 R8 R15

In the new V5 Robot Inspection checklist it specifically calls out <R8g> but the Cortex inspection checklist does not. Should it be considered that Cortex robots can not violate <R8g>

In the V5 checklist, it specifies that the sensor has been calibrated on competition fields - does this imply teams calibrate before inspect? on practice fields? home fields? before each match? If before a match, how much time should be allowed for teams to calibrate? This item does not have a rule associated with it. If we are to consider that the variance of lighting conditions is significant between fields, then it suggests this should be before each match and a <G> rule should be associated with it. V5 is all new to us, so <G2> is not there yet :)

In V5 check list it is implied that teams are allowed one controller - yet for Cortex two... <R15> does not make distinction between the two systems with regards to number of controllers.

I would recommend that the V5 inspection checklist be sorted in numerical order consistent with cortex, and that a single document (two sided) be provided so that the inspectors only need to pull one sheet and fill out accord to system.

thanks for the getting out the V5 checklist: <https://www.roboticseducation.org/documents/2018/09/vrc-v5-brain-robot-inspection-checklist.pdf>

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It would be impossible for teams to calibrate robots on the field before each match. Event Partners should take lighting conditions into consideration when planning for an event. The added statement "If Vision Sensor is used, it has been calibrated & tested on competition fields or team accepts responsibility for doing so" reminds teams that it is their responsibility to calibrate their robot matches begin so that they come to their first match prepared.

The V5 Robot Inspection Checklist has been updated to include up to 2 V5 Controllers, and rule <R8g> has been added to the Cortex Checklist. Keep in mind, all rules from the Game Manual still apply regardless if they are called out on the Robot Inspection Checklists. Please check www.RoboticsEducation.org for the latest versions.

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.

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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.

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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>.

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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.

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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?

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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.

55: USB Brain Dongle During Match Play

21-Aug-2018

R8

<https://photos.app.goo.gl/V7neAcQTPwD5xvnJ9>

While the students were working on their program, the micro usb port on the brain was strained and started causing connection failures when trying to update the brain. I was able to super glue a small dongle in place to allow them to connect it to the computer again, but wasn't sure if it would be considered legal in competitions.

It is permanently glued in place and has no affect on how the brain/robot operates during match play. If is tucked out of the way, could this be considered non-functional decoration as described in <R8>a?

<R8> Robots are allowed to use the following additional "non-VEX IQ" components: a. Appropriate non-functional decorations, provided that these do not affect the Robot performance in any significant way or affect the outcome of the Match. These decorations must be in the spirit of the event. Inspectors will have the final say in what is considered "non-functional".

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Yes, this would be legal, provided that it served no additional functions during a match. Plugging in a device with a secondary processor, like a phone or a Raspberry Pi, would be considered functional and would not be legal.

307: Rubber Band #117B

21-Jun-2019

R8

In the past the Legal Parts Appendix has included: Rubber Band #117B (228-2500-470), but no mention in Game Manual. Is# 117B legal?

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R8b reads as follows:

<R8>b: Rubber bands that are identical in length and thickness to those included in the VEX IQ product line (#32 & #64).

(in the future, please remember to include the applicable rule in your question)

Per R8b, #32 and #64 rubber bands are the only legal sizes. VEX IQ rubber bands can be found on the VEX website, here: <https://www.vexrobotics.com/rubber-bands.html>

2552: License plates that are 3D Printed

18-Feb-2025

R8

Hi, according to the game manual, as I read it, 3D printed license plates are allowed as long as they fit the size parameters and are non-functional.

Can they be held on with VEX screws, zip ties or the like? Because as I understand it those count as functional parts, but decorations (and license plates) that are non-VEX are allowed as long as they ONLY are used to hold the plate on.

So would it be allowed to have a 3D printed plate held on with, for example, zip ties, as long as it plays no functional role?

Regards Jesse Emepak, robotics coach [<R8>](#)

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License Plates can be connected to the Robot with any legal fastener.

2530: Allowed materials

13-Feb-2025

R8

[<R8>](#) Is commercial velcro allowed to hold the robot's battery?

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No, but the [VEX Robotics velcro Cinch Strap \(SKU #275-1258\)](#), [Hook & Loop Adhesive Strip \(SKU #275-1257\)](#), and [Hook & Loop Strap \(SKU #275-1259\)](#) are all legal for use on competition Robots.

252: Super Glue

25-Feb-2019

Other R7 R8

Can VEX IQ pieces be super glued on the robot

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No, this would not be legal. Glue is not permitted within the confines of <R7> and <R8>.

251: Smart cable repair

25-Feb-2019

R7 R8 R13

Hi, if a modular connector breaks a tab, how do we repair it to official Vex IQ specifications? Is it allowable for a team to cut off the bad connector and replace it with a new industry standard DEC 6P6C DEC modular connector using a DEC RJ11 crimp tool?



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No, this would not be legal.

2311: What qualifies as "Commercially Available?"

18-Nov-2024

R8

[<R8>](#)

My team and I have designed some 3D printed cable and tubing organizers, what do we need to do to classify these as commercially available? Is it enough for us to post the files online for free? Or do we need to sell them physically? Any help understanding this is very much appreciated! The main part of R8 we are confused about is part f.

?? ???? ?????? committee

Per clause G of rule [<R19>](#), functional 3D printed Robot parts are not legal for use in the VEX V5 Robotics Competition. Posting files online does not make them commercially available.

The intent of this rule is to make off-the-shelf parts like cable track or woven loom cable carrier legal for securing wires and pneumatic tubing--not to create a 3D printing loophole.

2290: Metal String Usage Clarification

12-Nov-2024

R8

Rule [<R8e>](#) states "An unlimited amount of rope/string, no thicker than 1/4" (6.35 mm)" is legal. My questions are:

1. Is metal string permissible under this definition?
2. Are accessories specifically for metal string, such as ferrules, metal wire thimbles, and wire rope clips, allowed for use in conjunction with metal string?

Best regards, 2130X

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1. Is metal string permissible under this definition?

The game manual does not provide a definition of "string." We're not going to provide one here, either. Instead, we'll point you to the 4th paragraph in Section 3 of the game manual:

Most of these rules are "hard limits," such as the maximum number of motors permitted. However, some are "at inspector discretion," such as determining a mechanism's potential safety risk. At many events, the lead inspector and the Head Referee are the same person; if they are not, then the volunteer inspector should confirm any questionable judgment calls with the Head Referee. The Head Referee has final authority regarding all Robot rules, since it is ultimately their decision whether a Robot takes the field for a Match after inspection has concluded (per [<R3d>](#) and [<R3e>](#)).

Regarding string, a material used on a Robot is string if the inspector and Head Referee at the event both agree that it's string. Some examples (fishing line, paracord, twine) would reasonably be considered string by most or all inspectors and referees. Others (dowel, pneumatic tubing, chain) would not (see rule [<G3>](#)). A few, including metal, would require judgment calls by the inspector and Head Referee based on how the material is used on the Robot, and opinions are likely to differ between events.

2. Are accessories specifically for metal string, such as ferrules, metal wire thimbles, and wire rope clips, allowed for use in conjunction with metal string?

No.