

Q&A

VRC 2019-2020: Tower Takeover

Tagged: R7



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 Tower Takeover 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 Tower Takeover 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

[Commercially Available Standoffs](#)

[<R7> Is 228-3201-1934 Legal?](#)

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

[VEX-U hardware allowances.](#)

[Legal Parts Appendix](#)

[<VUR6> Clarification](#)

[R7.c regarding commercially available nuts for screws](#)

[Non-Vex Screws & Nuts - aluminum / nylon](#)

[R7i 1/8" Nylon Paracord](#)

[Hardware specified by VEXpro, but not available from VEXpro.](#)

[Are the number plates legal or illegal?](#)

[Making Smart Cords](#)

[Use of Color Filter for Vision Sensor](#)

[Can a team make custom paddles for their controllers?](#)

[Vision sensor](#)

[\(II\)Legal parts list](#)

[Double Park Mechanism](#)

[<R7e>. is Paracord still legal?](#)

[Super Glue](#)

[Smart cable repair](#)

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!

Answered by Game Design Committee

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

989: <R7> Is 228-3201-1934 Legal?

1-Jan-2022

R7

The part is not in either the legal parts, nor the illegal parts list. A similar item is found in legal parts listed as 228-2500-1934, we would assume 228-3201-1934 should be legal as it's just different color of the legal version. But an official clarification would be appreciated.

Answered by Game Design Committee

Yes, this is legal.

The Legal Parts Appendix includes the following introduction on page 2:

Because VEX IQ parts come in many colors, any colors depicted in the renderings below may not necessarily reflect the colors of the final physical products.

This also means that if a part has the same Unique Part Identifier (i.e. last 3-4 digits) as a part listed in this Appendix, but a different Color SKU Identifier, then it is still considered legal. This article explains the VEX IQ part number system in more detail: <https://kb.vex.com/hc/en-us/articles/360044274672-Color-Part-Number-Info-for-VEX-IQ>

We will be sure to clarify this further in a future VIQC Legal Parts Appendix 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.

Answered by Game Design Committee

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. 1/8" metal shafts from the VEX V5 product line.

8: VEX-U hardware allowances.

15-May-2018

R7 VEX U

Hardware for VRC is given under <R7> c. Any commercially available #4, #6, #8, M2, M2.5, M3 or M4 screw up to 2" long (nominal), and any commercially available nut and/or washer to fit these screws.

<VUR2> a. i. expands this to "Small hardware, such as screws and nuts found in VRC field kits, are permitted."

Is the intent of VUR2 to allow any hardware up to size 1/4" (M6) for VEX-U? VEX-Pro does not specifically sell hardware, but some hardware is included in various components, such as VERSADROP has 1/4" and #10 hardware included. Also, Versaframe specifies #8 screws or 5/32" aluminum rivets for assembly, but VEXPRO does not sell either in the catalog. Would aluminum rivets (and any size steel screw or nut for that matter) fall under the "unlimited aluminum and steel" since

both types of fasteners could be machined from aluminum or steel bar stock as allowed by <VUR-3>c?

Answered by Game Design Committee

The intent of VUR2a-i was specifically in reference to field kits, which are not permitted (per VUR2a). It would not be feasible to differentiate between a screw that came from a field kit and a "normal" screw. VUR2a-i was not meant to stand alone as a blanket allowance for small hardware beyond R7c.

That being said, rivets and hardware found inside of VEXpro kits are considered legal fasteners for VEX U. We will be sure to clarify this in the June 15th update.

79: Legal Parts Appendix

15-Sep-2018

R7

Will the legal parts appendix be available this year? <R7> indicates that it will be:

Note: A comprehensive list of legal parts can be found in the VEX IQ Challenge Legal Parts Appendix, at <https://www.vexrobotics.com/vexiq/competition/viqc-current-game>

However, it is not on the page.

Thanks!

Answered by Game Design Committee

Thank you for bringing this to our attention. The webpage has been updated to include these Appendices.

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 Game Design 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.

54: R7.c regarding commercially available nuts for screws

20-Aug-2018

R7

Rule R7.c allows for "Any commercially available #4, #6, #8, M2, M2.5, M3 or M4 screw up to 2" long (nominal), and any commercially available nut and/or washer to fit these screws."

I would like to ascertain that nuts known as cap nuts (sometimes called acorn nuts) can be used under this rule.

McMaster describes them thusly: "Also known as acorn nuts, they have a smooth rounded head that covers and protects threads while providing a finished appearance."

A link to an example with a picture can be found here: <https://www.mcmaster.com/#91855a440/=1e8raxb>

Thanks

Answered by Game Design Committee

The rest of <R7c> states the following:

The intent of the rule is to allow teams to purchase their own commodity hardware without introducing additional functionality not found in standard VEX equipment. It is up to inspectors to determine whether the non-VEX hardware has introduced additional functionality or not.

If used simply to protect threads and provide a finished appearance, these nuts would be legal. However, if used for another purpose (such as a form of ball caster or to interact with a sensor in a way that a standard nut would not), then that would be considered "introducing additional functionality" and would not be legal.

47: Non-Vex Screws & Nuts - aluminum / nylon

9-Aug-2018

R7

<R7> Robots are allowed the following additional "non-VEX" components: c. Any commercially available #4, #6, #8, M2, M2.5, M3 or M4 screw up to 2" long (nominal), and any commercially available nut and/or washer to fit these screws. The intent of the rule is to allow teams to purchase their own commodity hardware without introducing additional functionality not found in standard VEX equipment. It is up to inspectors to determine whether the non-VEX hardware has introduced additional functionality or not.

Are we allowed to use aluminum and nylon/plastic screws & nuts (examples below) as long as they are commercially available, are sizes listed above, and are only up to 2" long?

<https://www.mcmaster.com/#93143a194/=1e2q1gl>

<https://www.mcmaster.com/#94735A737>

<https://www.robosource.net/aluminum-screws-nuts/253-alu-screw-0500.html>

<https://www.mcmaster.com/#94812A400>

Answered by Game Design Committee

Yes, these would be legal.

In general, as long as the screws do not provide additional functionality beyond a standard screw (such as an eye bolt), "any screw" means "any screw". Properties like material type or color are irrelevant.

45: R7i 1/8" Nylon Paracord

8-Aug-2018

R7

R7 states: "Robots are allowed the following additional "non-VEX" components: i. An unlimited amount of 1/8" (or local metric equivalent), braided, nylon rope"

Is ?" 100% nylon braided paracord legal under this rule? For example,

<https://www.homedepot.com/p/Everbilt-1-8-in-x-500-ft-Black-Premium-Nylon-Paracord-70070/206192268>

Answered by Game Design Committee

Yes, this is legal, so long as it is 1/8" in diameter and made of braided nylon.

41: Hardware specified by VEXpro, but not available from VEXpro.

24-Jul-2018

R7 VEX U

Sorry to be so nitpicky, but there are a couple points on hardware that was not clarified on the June 15th update:

"Answered by Game Design Committee That being said, **rivets and hardware** found inside of VEXpro kits are considered legal fasteners for VEX U. We will be sure to clarify this in the June 15th update." (emphasis mine).

There are six references to a McMaster Carr part within the vexpro product specifications, two for master links, three for screws, and one for a washer.

On the page for roller chain: <https://www.vexrobotics.com/roller-chain.html> "Note: VEXpro does not offer a #35 master link for purchase separately. We recommend McMaster-Carr part number 6261K191 as a suitable replacement. The #25 Roller Chain requires a standard master link. VEXpro does not offer a standard #25 master link. We recommend McMaster-Carr part number 6261K108 as a suitable replacement."

And on the page for the linear gussets:

<https://content.vexrobotics.com/vexpro/pdf/217-4399-20180116.PDF> "(Note: Some McMaster parts required)" and the BOM lists the following: McMaster P/N 91251A555 1/4-20 x 3.250" Screw
McMaster P/N 91251A553 1/4-20 x 2.750" Screw
McMaster P/N 91251A550 1/4-20 x 2.000" Screw
McMaster P/N 92141A029 9/32" ID x 5/8" OD Washer

Additionally, the versaframe page notes using 5/32 rivets for assembly (<https://www.vexrobotics.com/versaframestock.html>), but these are not sold by VEXpro, only 1/8 rivets are available.

Do the references to McMaster-Carr parts, and to a 5/32 rivet, make these McMaster-Carr parts legal for VEX-U?

If so, then would the legality of a 1/4-20 x 3.250" screw (McMaster 91251A555) make any shorter screw lengths of 1/4-20 screw legal also (since long screws can obviously be cut shorter). In the same way, VEXpro sells a #10-32 x 2.5 long screw and 10-32 locknut (in kit 217-4824), so would this make #10 screws up to 2.5 long also be legal?

Thank you for your time and consideration.

Answered by Game Design Committee

Sorry to be so nitpicky, but there are a couple points on hardware that was not clarified on the June 15th update.

No apology needed, these types of questions are beneficial to all teams as we work through the nuanced implications of this year's VEX U rules.

Do the references to McMaster-Carr parts, and to a 5/32 rivet, make these McMaster-Carr parts legal for VEX-U?

For the most part, yes.

The #25 master link (6261K108) is legal for this purpose (alongside VEXpro #25 chain).

The following items will be clarified in the August 17th manual update:

- All rivets up to 1/4" will be legal
- 1/4-20 screws, washers, and nuts will be legal
- #10 screws, washers, and nuts will be legal (in addition to the #4, #6, and #8 screws as specified in R7-c)

375: Are the number plates legal or illegal?

13-Oct-2019

R7

Howdy!

The number plates from the last few year's games are not in the legal or illegal appendices.

I assume they are not allowed for robot construction because of < R7 > c:

c. Only the VEX IQ components specifically designed for use in Robot construction are allowed. Using additional components outside their typical purpose is against the intent of the rule (i.e. please don't try using VEX IQ apparel, team or event support materials, packaging, **Field Elements**, that are not listed in the Legal Parts Appendix or other non-robot products on a VEX IQ Challenge Robot)

Emphasis mine.

I would also think that the plates could be used as a non functional decoration.

But what I THINK doesn't matter... How say you?

Answered by Game Design Committee

The number plates used on VEX IQ Challenge fields can be considered equivalent to part 228-2500-292, Blank VRC / VEXU Team Number Plate, which is included in the Legal Parts Appendix. Therefore, yes, they are legal. We will look into updating the Legal Parts Appendix to reflect this more clearly in the future.

37: Making Smart Cords

14-Jul-2018

R7

Are teams allowed to make SMART Cords using cable and a crimper?

Answered by Game Design Committee

No, this is not legal.

368: Use of Color Filter for Vision Sensor

1-Oct-2019

R7

Under R7a color filters are allowable for Light Sensors, is it an option to use color filters for the VEX Vision sensor? A color filter could be employed to assist in the more accurate detection of a single color--i.e. green, orange, etc. This is important given the fact that the flashlight is not compatible with V5.

Answered by Game Design Committee

This would be permissible if the hypothetical filter satisfied all other Robot rules, such as R9:

< R9 > A limited amount of custom plastic is allowed. Robots may use non-shattering plastic from the following list; polycarbonate (Lexan), acetel monopolymer (Delrin), acetal copolymer (Acetron GP), POM (acetal), ABS, PEEK, PET, HDPE, LDPE, Nylon (all grades), Polypropylene, FEP; as cut from a single 12" x 24" sheet up to 0.070" thick.

- a. Shattering plastic, such as PMMA (also called Plexiglass, Acrylic, or Perspex), is prohibited.
- b. Plastic may be mechanically altered by cutting, drilling, bending etc. It cannot be chemically treated, melted, or cast. Heating polycarbonate to aid in bending is acceptable.

345: Can a team make custom paddles for their controllers?

3-Sep-2019

R7

<R7> VEX IQ parts only. Robots may be built ONLY from official robotic components from the VEX IQ product line, unless otherwise specifically noted within these rules.

Curious if you can make custom 3-D parts for controllers. <R7> only covers the robot itself.

Answered by Game Design Committee

There are no rules prohibiting this, therefore it is legal, provided no other rules are violated (such as G8).

323: Vision sensor

23-Jul-2019

R7

Can the vision sensor be used in the competition?

Answered by Game Design Committee

The Vision Sensor is included in the VIQC Squared Away Illegal Parts Appendix, and is therefore not legal for competition use.

<https://link.vex.com/docs/viqc-squared-away-IllegalParts>

314: (II)Legal parts list

2-Jul-2019

R7

According to the note at the end of <R7>,

Note: A comprehensive list of legal parts can be found in the VEX IQ Challenge Legal Parts Appendix, which will be released alongside the June 14th Game Manual Update (as noted in <G17>.

As this has passed by a couple of weeks, are the lists available somewhere? Thanks!

Answered by Game Design Committee

We sincerely apologize for the delay in the release of these documents. They have now been posted and can be found at this page:

<https://www.vexrobotics.com/vexiq/competition/viqc-current-game>

3097: Double Park Mechanism

16-Feb-2026

R7 SG1 SG7

We have built a double park mechanism that is a cage that holds a block. It follows the rule of SG1 and SG5. We are concerned about R7. We use one screw to tighten the c channel into a stand off to keep the block in the robot. We would need to unscrew it to get it out. R7 states easy removal and without power. Would unscrewing one screw to remove the block be considered easy removal?

Answered by Game Design Committee

Even though it's only one screw, you shouldn't have to take a Robot apart to any extent to remove Scoring Objects. Removing a Block from your Robot mechanism as described would not be considered easy removal, and would therefore be in violation of [<R7>](#).

It's acceptable to have to use your hands to rotate a mechanism out of the way (e.g., spin some rollers, pull open a claw, etc.) in order to remove Blocks. Generally speaking, that is all considered easy removal. It's not acceptable to require a Robot to be powered on to actuate those mechanisms, nor is it acceptable to have to unscrew parts, unhook rope/mesh, disconnect wires, or otherwise dismantle any part of your Robot to remove Scoring Objects.

287: <R7e>. is Paracord still legal?

25-May-2019

R7

With the question of prior Q&A rulings in the air, we would like to know if paracord still meets the definition of unlimited 1/8" braided nylon rope?

<https://www.vexforum.com/t/answered-alternate-rope/30162>

Thank you!

Answered by Game Design Committee

Please see rule R7e, quoted here for reference:

<R7> Certain non-VEX EDR components are allowed. Robots are allowed the following additional "non-VEX" components:

e. An unlimited amount of 1/8" (or local metric equivalent), braided, nylon rope

The term "paracord" describes neither diameter nor material type.

There are some ropes branded as "paracord" which would be legal, as they are made of braided nylon and are 1/8" in diameter:

- <https://paracord.com/collections/550-solids/products/acid-brown-1>
- <https://www.homedepot.com/p/Everbilt-1-8-in-x-500-ft-Black-Premium-Nylon-Paracord-70070/206192268>

There are also ropes branded as "paracord" which would not be legal, as they either have materials other than braided nylon, or are larger than 1/8".

- <https://paracord.com/collections/paramax/products/black-paramax>
- <https://paracord.com/collections/1-8-shock-cord/products/1-8-shock-cord-acid-purple>

252: Super Glue

25-Feb-2019

Other R7 R8

Can VEX IQ pieces be super glued on the robot

Answered by Game Design Committee

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?



Answered by Game Design Committee

No, this would not be legal.